7 Air Quality and Odour

7.1 Introduction

7.1.1 This chapter summarises the assessment of air quality and odour effects associated with the proposed Recycling, Recovery and Renewable Energy (3Rs) Facility at Langhurstwood Road, Horsham, West Sussex.

Scope of Study

7.1.2 The potential air quality effects from the construction and operation of the proposed facility are considered to be:

- Construction effects - potential dust effects from construction activities; emissions from plant associated with on-site construction and potential effects associated with emissions from construction vehicles on the local road network;
- Operational effects (from facility) - potential air quality effects from the thermal treatment stack; potential fugitive dust, odour and bio-aerosol effects; and
- Operational effects (from traffic): potential air quality effects from changes in traffic flow characteristics on the local road network associated with the operation of the proposed facility.

7.1.3 During construction, predicted traffic flows would be below the relevant indicative criteria set by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) for determining when an air quality assessment is required. Therefore, an assessment of construction phase emissions from traffic has been scoped out of the assessment. Further details are provided in Section 7.3 of this chapter.

7.1.4 As the Heavy Goods Vehicle (HGV) movements associated with the operational phase of the 3Rs Facility would be no greater than those associated with the existing consent at the site, an assessment of operational phase emissions from traffic has been scoped out of the assessment.

7.1.5 Bio-aerosol emissions during the operational phase are not expected to be significant and are not considered further within this assessment. Details are provided in Section 7.3.

Study Area

7.1.6 The study area for the assessment differs for the construction and operational phases. The study areas in each case are described in detail within the methodology that follows, referencing the relevant guidance documents.

7.2 Legislation and Policy Context

7.2.1 This section summarises relevant legislation and policies that are relevant to air quality and odour issues.

Legislation

<u>Industrial Emissions Directive Limits</u>

7.2.2 The plant would be designed and operated in accordance with the requirements of the Industrial Emissions Directive (2010/75/EU), known hereafter as the IED, which requires adherence to emission limits for a range of pollutants.

7.2.3 Emission limits in the IED are specified in the form of half-hourly mean concentrations; daily-mean concentrations; mean concentrations over a period of between 30 minutes and 8 hours; or, for dioxins and furans, mean concentrations evaluated over a period of between 6 and 8 hours.

7.2.4 For the purposes of this assessment for those pollutants having only one emission limit (for a single averaging period), the facility has been assumed to operate at that limit. Where more than one limit exists for a pollutant, the half-hourly mean emission concentration limit has been used to calculate short-term (less than 24 hour average) peak ground-level concentrations (Scenario 1). The daily mean emission concentration limit has been used for these pollutants to calculate long-term (greater than 24-hour average) mean ground-level concentrations (Scenario 2). The IED emission limit values are provided in Table 7.1.

Table 7.1: Relevant Industrial Emission Directive Limit Values

Pollutant	Scenario 1 Short-Term Emission Limits ($mg.Nm^{-3}$)	Scenario 2 Daily-Mean Emission Limits ($mg.Nm^{-3}$)
Particles	30	10
Hydrogen chloride (HCl)	60	10
Hydrogen fluoride (HF)	4	1
Sulphur dioxide (SO_2)	200	50
Nitrogen oxides (NO_x)	400	200
Carbon monoxide (CO)	-	50
Group 1 metals (a)	-	0.05 (d)
Group 2 metals (b)	-	0.05 (d)
Group 3 metals (c)	-	0.5 (d)
Dioxins and furans	-	0.0000001 (e)

Notes: All concentrations referenced to temperature 273 K, pressure 101.3 kPa, 11% oxygen, dry gas.
(a) Cadmium (Cd) and thallium (Tl).
(b) Mercury (Hg).
(c) Antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni), and vanadium (V).
(d) All average values over a sample period of a minimum of 30 minutes and a maximum of 8 hours.
(e) Average values over a sample period of a minimum of 6 hours and a maximum of 8 hours. The emission limit value refers to the total concentration of dioxins and furans calculated using the concept of toxic equivalence (TEQ).

Environmental Permitting Regulations

7.2.5 EU Directive 96/61/EC concerning Integrated Pollution Prevention and Control ("the IPPC Directive") applies an integrated environmental approach to the regulation of certain industrial activities. The Environmental Permitting Regulations 2016 implement the IPPC Directive relating to installations in England and Wales. The Regulations define activities that require an Environmental Permit from the Environment Agency.

7.2.6 Environmental permitting is a regulatory system that employs an integrated approach to control the environmental impacts of certain listed industrial activities including the generation of energy from waste. The intention of the regulatory system is to ensure that Best Available Techniques (BAT), required by the IPPC Directive, are used to prevent or minimise the effects of an activity on the environment, having regard to the effects of emissions to air, land and water via a single permitting process.

7.2.7 To gain a permit, operators have to demonstrate in their applications, in a systematic way, that the techniques they are using or are proposing to use are the BAT for their installation and meet certain other requirements taking account of relevant local factors. The permitting process also places a duty on the regulating body to ensure that the requirements of the IED are included for permitted sites to which these apply.

7.2.8 The essence of BAT is that the techniques selected to protect the environment should achieve a high degree of protection of people and the environment taken as a whole. Indicative BAT standards are laid out in national guidance and, where relevant, should be applied unless a different standard can be justified for a particular installation. The Environment Agency is legally obliged to go beyond BAT requirements where European Union (EU) Air Quality Limit Values may be exceeded by an existing operator.

7.2.9 The Environment Agency online guidance entitled 'Environmental management – guidance, Air emissions risk assessment for your environmental permit' (Environment Agency, 2016) sets out guidelines for air dispersion modelling. The assessment of air quality effects for the proposed development is consistent with this guidance.

Waste Framework Directive

7.2.10 Directive 2008/98/EC of the European Parliament and Council on Waste requires member states to ensure that waste is recovered or disposed of without harm to human health and the environment. It requires member states to impose certain obligations on all those dealing with waste at various stages. Operators of waste disposal and recovery facilities are required to obtain a permit, or register a permit exemption. Retention of the permit requires periodic inspections and documented evidence of the activities in respect of waste.

7.2.11 The Waste Framework Directive (WFD) requires member states to take appropriate measures to establish an integrated and adequate network of disposal installations. The WFD also promotes environmental protection by optimising the use of resources, promoting the recovery of waste over its disposal (the "waste hierarchy").

7.2.12 Annex I and II of the WFD provide lists of the operations which are deemed to be "disposal" and "recovery", respectively. The terms are mutually exclusive and an operation cannot be a disposal and recovery operation simultaneously. Where the operation is deemed to be a disposal operation, the permit will contain more extensive conditions than for a recovery operation.

7.2.13 The principal objective of a recovery operation is to ensure that the waste serves a useful purpose, replacing other substances which would have been used for that purpose. Where the combustion of waste is used to provide a source of energy, the operation is deemed to be a recovery operation.

7.2.14 The proposed development is deemed to be a recovery operation on the basis that the operation falls under the description of the first operation listed under Annex II:

"R 1 Use principally as a fuel or other means to generate energy"

7.2.15 The Environmental Permitting Regulations 2016 implement the WFD in the UK. As such, the Environment Agency is responsible for implementing the obligations set out in the WFD.

Ambient Air Quality Criteria

7.2.16 There are several EU Air Quality Directives and UK Air Quality Regulations that will apply to the operation of the proposed facility. These provide a series of statutory air quality limit values, target values and objectives for pollutants, emissions of which are regulated through the IED.

7.2.17 There are some pollutants regulated by the IED which do not have statutory air quality standards prescribed under current legislation. For these pollutants, a number of non-statutory air quality objectives and guidelines exist which have been applied within this assessment. The Environment Agency provides further assessment criteria in its online guidance.

The Ambient Air Quality Directive and Air Quality Standards Regulations

7.2.18 The 2008 Ambient Air Quality Directive (2008/50/EC) aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants; it sets legally binding concentration-based limit values, as well as target values. There are also information and alert thresholds for reporting purposes. These are to be achieved for the main air pollutants: particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), carbon monoxide (CO), lead (Pb) and benzene. This Directive replaced most of the previous EU air quality legislation and in England was transposed into domestic law by the Air Quality Standards (England) Regulations 2010, which in addition incorporates the 4th Air Quality Daughter Directive (2004/107/EC) that sets targets for ambient air concentrations of certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). Member states must comply with the limit values (which are legally binding on the Secretary of State) and the Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values. The statutory air quality limit values are listed in Table 7.2.

Table 7.2: Statutory Air Quality Limit Values

Pollutant	Averaging Period	Limit Values	Not to be Exceeded More Than
Nitrogen Dioxide (NO_2)	1 hour	200 $\mu g.m^{-3}$	18 times pcy
	Annual	40 $\mu g.m^{-3}$	-
Particulate Matter (PM_{10})	24 hour	50 $\mu g.m^{-3}$	35 times pcy
	Annual	40 $\mu g.m^{-3}$	-
Particulate Matter ($PM_{2.5}$)	Annual	25 $\mu g.m^{-3}$	-
Carbon Monoxide	Maximum daily running 8 hour mean	10,000 $\mu g.m^{-3}$	-
Sulphur Dioxide (SO_2)	15 minute	266 $\mu g.m^{-3}$	> 35 times pcy
	1 hour	350 $\mu g.m^{-3}$	> 24 times pcy
	24 hour	125 $\mu g.m^{-3}$	> 3 times pcy
Lead	Annual	0.25 $\mu g.m^{-3}$	-
Arsenic (As)	Annual (b)	0.006 $\mu g.m^{-3}$	-
Cadmium (Cd)	Annual (b)	0.005 $\mu g.m^{-3}$	-
Nickel (Ni)	Annual (b)	0.02 $\mu g.m^{-3}$	-

Non-Statutory Air Quality Objectives and Guidelines

7.2.19 The Environment Act 1995 established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007 (Defra, 2007). The Strategy sets UK air quality standards and objectives for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the EU Directives.

7.2.20 Non-statutory air quality objectives and guidelines also exist within the World Health Organisation Guidelines (WHO, 2005) and the Expert Panel on Air Quality Standards Guidelines (EPAQS) (2006). The non-statutory objectives and guidelines are presented in Table 7.3.

Table 7.3: Non-Statutory Air Quality Objectives and Guidelines

Pollutant	Averaging Period	Guideline	Target Date
Particulate Matter ($PM_{2.5}$)	Annual	Target of 15% reduction in concentrations at urban background locations	Between 2010 and 2020 (a)
	Annual	25 $\mu g.m^{-3}$	2020 (a)
PAHs (as B[a]P equivalent)	Annual (a)	0.00025 $\mu g.m^{-3}$	-
Sulphur Dioxide (SO_2)	Annual (b)	50 $\mu g.m^{-3}$	-
Hydrogen Chloride	1 hour (c)	750 $\mu g.m^{-3}$	-
Hydrogen Fluoride	1 hour (c)	160 $\mu g.m^{-3}$	-

Notes:
(a) Target date set in UK Air Quality Strategy 2007
(b) World Health Organisation Guidelines
(c) EPAQS recommended guideline values

Environmental Assessment Levels

7.2.21 The Environment Agency online guidance entitled *'Environmental management – guidance, Air emissions risk assessment for your environmental permit'* (Environment Agency, 2016) provides further assessment criteria in the form of Environmental Assessment Levels (EALs).

7.2.22 Table 7.4 presents all available EALs for the pollutants relevant to this assessment.

Table 7.4: Environmental Assessment Levels (EALs)

Pollutant	Long-term EAL, $\mu g.m^{-3}$	Short-term EAL, $\mu g.m^{-3}$
Nitrogen dioxide (NO_2)	40 [(a)]	200
Carbon monoxide (CO)	-	10,000
Sulphur dioxide (SO_2)	50	267
Particulates (PM_{10})	40 [(a)]	50
Particulates ($PM_{2.5}$)	25	-
Hydrogen chloride (HCl)	-	750
Hydrogen fluoride (HF)	16 (monthly average)	160
Arsenic (As)	0.003	-
Antimony (Sb)	5	150
Cadmium (Cd)	0.005	-
Chromium (Cr)	5	150
Chromium VI ((oxidation state in the PM_{10} fraction)	0.0002	-
Cobalt (Co)	0.2 (a)	6 (a)
Copper (Cu)	10	200
Lead (Pb)	0.25	-
Manganese (Mn)	0.15	1500
Mercury (Hg)	0.25	7.5
Nickel (Ni)	0.02	-
Thallium (Tl)	1 (a)	30 (a)
Vanadium (V)	5	1
PAHs (as B[a]P equivalent)	0.00025	-

Note: [(a)] EALs have been obtained from the Environment Agency earlier Horizontal Guidance Note EPR H1 guidance note (Environment Agency, 2010) as no levels are provided in the current guidance.

7.2.23 Table 7.5 presents available soil quality criteria and maximum deposition rates from the Environment Agency (2016) for the pollutants relevant to this assessment.

Table 7.5: Maximum Deposition Rates (from Environment Agency, 2016)

Pollutant	Maximum Deposition Rate ($mg.m^{-2}.d^{-1}$)
Arsenic (As)	0.02
Cadmium (Cd)	0.009
Chromium (Cr)	1.5
Copper (Cu)	0.25
Lead (Pb)	1.1
Mercury (Hg)	0.004
Nickel (Ni)	0.11

7.2.24 Within the assessment, the statutory air quality limit and target values (as presented in Table 7.2) are assumed to take precedent over objectives, guidelines and the EALs. In addition, for those pollutants which do not have any statutory air quality standards, the assessment assumes the lower of either the EAL or the non-statutory air quality objective or guideline where they exist.

National Policy and Guidance

National Planning Policy Framework (2012)

7.2.25 The National Planning Policy Framework (NPPF) (DCLG, 2012) is a material consideration for local planning authorities and decision-takers in determining applications. At the heart of the NPPF is a presumption in favour of sustainable development. For determining planning applications, this means approving development proposals if they accord with the local development plan, unless material considerations indicate otherwise. If the development plan is absent, silent or the policies are out of date, then planning permission should be granted unless any adverse impacts would significantly outweigh the benefits, or specific policies in the NPPF indicate development should be restricted.

7.2.26 The NPPF sets out 12 core land-use planning principles. The relevant core-principle in the context of this air quality assessment is that planning should *"contribute to conserving and enhancing the natural environment and reducing pollution"*. (Paragraph 17)

7.2.27 Under the heading 'Conserving and Enhancing the Natural Environment', the NPPF states that:

"The planning system should contribute to and enhance the natural and local environment by:

preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability… "(Paragraph 109)

National Planning Policy for Waste

7.2.28 The National Planning Policy for Waste (DCLG, 2014a) specifically refers to emissions to air, including dust, in the criteria for selecting a suitable site for a waste facility. It states that:

"Considerations will include the proximity of sensitive receptors, including ecological as well as human receptors, and the extent to which adverse emissions can be controlled through the use of appropriate and well-maintained and managed equipment and vehicles."

Planning Practice Guidance Air Quality

7.2.29 The National Planning Practice Guidance (NPPG) was issued on-line on 6th March 2014 (DCLG, 2014b) and is periodically updated by Government. The Air Quality section of the NPPG describes the circumstances when air quality, odour and dust can be a planning concern, requiring assessment.

7.2.30 The NPPG advises that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

7.2.31 The NPPG states that when deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

"Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.

Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area;

Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.

Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.

Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."

7.2.32 The NPPG provides advice on how air quality impacts can be mitigated:

"*Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met."*

Development Plan Policy

West Sussex Waste Local Plan

7.2.33 Policy W16: Air, Soil, and Water of the West Sussex Waste Local Plan (West Sussex County Council and South Downs National Park Authority, 2014) states that:

"Proposals for waste development will be permitted provided that:

(a) there are no unacceptable impacts on the intrinsic quality of, and where appropriate the quantity of, air, soil, and water resources (including ground, surface, transitional, and coastal

waters);

(b) there are no unacceptable impacts on the management and protection of such resources, including any adverse impacts on Air Quality Management Areas and Source Protection Zones;

(c) the quality of rivers and other watercourses is protected and, where possible, enhanced (including within built-up areas); and

(d) they are not located in areas subject to land instability, unless problems can be satisfactorily resolved."

Horsham District Planning Framework

7.2.34 The key policy of the Horsham District Planning Framework (Horsham District Council, 2015) relevant to this assessment is Policy 24: Environmental Protection which states that:

"The high quality of the district's environment will be protected through the planning process and the provision of local guidance documents. Taking into account any relevant Planning Guidance Documents, developments will be expected to minimise exposure to and the emission of pollutants including noise, odour, air and light pollution and ensure that they:

1. Address land contamination by promoting the appropriate re-use of sites and requiring the delivery of appropriate remediation;

2. Are appropriate to their location, taking account of ground conditions and land instability;

3. Maintain or improve the environmental quality of any watercourses, groundwater and drinking water supplies, and prevents contaminated run-off to surface water sewers;

4. Minimise the air pollution and greenhouse gas emissions in order to protect human health and the environment;

5. Contribute to the implementation of local Air Quality Action Plans and do not conflict with its objectives;

6. Maintain or reduce the number of people exposed to poor air quality including odour. Consideration should be given to development that will result in new public exposure, particularly where vulnerable people (e.g. the elderly, care homes or schools) would be exposed to the areas of poor air quality; and

7. Ensure that the cumulative impact of all relevant committed developments is appropriately assessed."

7.3 Assessment Methodology

Consultation

7.3.1 In carrying out the air quality and odour assessment, consultation has included a formal request for a scoping opinion. The issues raised through the consultation that are relevant to air quality and odour are summarised in Table 7.6 below.

7.3.2 A full copy of the Scoping Opinion is contained in Appendix 4.2.

Table 7.6: Consultation Responses Relevant to Air Quality and Odour

Date/Source	Consultee and Issues Raised	How/ Where Addressed
October 2015/ Scoping Opinion	West Sussex County Council – 1. Demonstrate that emissions would not give rise to human health impacts. 2. The impact of emissions from vehicles. 3. Reference to control and monitoring required by the Environmental Permitting Process. 4. In-combination impacts with user of adjacent site users including Brookhurst Wood landfill. 5. Visibility of the plume.	1. The results of an assessment of human health impacts associated with stack emissions are provided in Section 7.7. 2. During the construction phase, the number of vehicle movements generated by activities is below the threshold for assessment and the effects can be considered insignificant. This is explained in Section 7.3. During the operational phase, the impact of emissions from vehicles has not been assessed as there will be no change in HGV movements over and above the site's extant consent. 3. The monitoring required by the Environmental Permitting Process is referenced in Section 7.13. 4. In-combination impacts with user of adjacent site users including Brookhurst Wood landfill. Cumulative impacts are considered in Section 7.9. 5. The summary of the results of the plume visibility is provided in Section 7.7.
Letter dated 23 November 2015 to West Sussex County Council	Gatwick Airport Limited – request for 'plume dispersal' modelling including any 'maximum projected heights for the emissions'.	The summary of the results of the plume visibility is provided in Section 7.7.
Letter dated 7 October 2016 to Vismundi Limited	Gatwick Airport Limited – Requested that when available *"we have sight of details of any emissions from the stack to ensure that there will be no impact on either aircraft or navigational aids."*	The summary of the results of the plume visibility is provided in Section 7.7. The detailed modelled output has been provided to Gatwick Airport Limited.
Regulation 22 Responses – West Sussex County Council	Inclusion of sensitive receptors within the Land North of Horsham development.	See Table 7.11, paragraph 7.9.3, Table 7.24, Appendix 7.5, Figure 7.3 and Figure 7.4. See Appendix 7.5: Predicted Concentrations at Discrete Sensitive Receptors.
	Consideration of NO_2 and PM_{10} background concentrations at Langhurstwood Road.	See Appendix 7.4, paragraph 7.4.14.
	Justification for the use of Lullington Heath as a source of data for informing the background SO_2 concentrations. Further consideration of metals deposition.	Metal deposition rates at sensitive receptors have now been provided in Appendix 7.5: Predicted Concentrations and Metal Deposition Rates at Discrete Sensitive Receptors. For mercury, a more realistic emission rate has been obtained from the draft BAT Ref Doc on Waste incineration

Assessment Methodology - Construction

7.3.3 Regarding exhaust emissions from construction-related vehicles (contractors' vehicles and HGVs, diggers, and other diesel-powered vehicles), these are unlikely to have a significant effect on local air quality except for large, long-term construction sites. The Environmental Protection UK (EPUK)/Institute of Air Quality Management (IAQM) (2015) Land-Use Planning & Development Control: Planning For Air Quality document indicates that vehicle emissions should be assessed where developments increase annual average daily Heavy Duty Vehicle (HDV) traffic flows by more than 100 and annual average daily Light Duty Vehicle (LDV) traffic flows by more than 500, outside an Air Quality Management Area (AQMA). The maximum predicted number of HDVs in any month of construction for the 3Rs Facility is 36 and the maximum predicted number of LDVs in any month of construction is 122. These traffic flows are below the indicative criteria and the EPUK/IAQM guidance continues by stating that *"If none of the criteria are met, then there should be no requirement to carry out an air quality assessment… and the impacts can be considered as having an insignificant effect".* As the aforementioned EPUK/IAQM thresholds are not expected to be exceeded during the construction phase of the project, the air quality effects from construction-vehicle exhaust emissions are not considered significant.

7.3.4 Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter (BSI, 1983). Particles greater than 75 µm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.

7.3.5 The effects of dust are linked to particle size and two main categories are usually considered:

- PM_{10} particles, those up to 10 µm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and
- Dust, generally considered to be particles larger than 10 µm which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.

7.3.6 The *IAQM 'Guidance on the assessment of dust from demolition and construction'* (IAQM, 2014a) sets out 350 metres as the distance from the site boundary and 50 metres from the site traffic route(s) up to 500 m of the entrance, within which there could potentially be nuisance dust and PM_{10} effects on human receptors. These distances are set to be deliberately conservative.

7.3.7 Concentration-based limit values and objectives have been set for the PM_{10} suspended particle fraction, but no statutory or official numerical air quality criterion for dust annoyance has been set at a UK, European or WHO level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.

7.3.8 The IAQM dust guidance aims to estimate the impacts of both PM_{10} and dust through a risk-based assessment procedure. The IAQM dust guidance document states that: *"The impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified."*

7.3.9 The IAQM dust guidance provides a methodological framework, but notes that professional judgement is required to assess effects: *"This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified."*

7.3.10 Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach. The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e. the route through the air) from source to receptor.

7.3.11 The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement, taking into account both the change in dust levels (as indicated by the Dust Impact Risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.

7.3.12 The detail of the dust assessment methodology is provided in Appendix 7.1.

7.3.13 The dust risk categories that have been determined for each of the three activities (earthworks, construction and trackout) have been used to define the appropriate site-specific mitigation measures based on those described in the IAQM dust guidance. The guidance states that provided the mitigation measures are successfully implemented, the resultant effects of the dust exposure will normally be "not significant".

Assessment Methodology - Operation

Vehicle-related Emissions

7.3.14 There will be no change in HGV movements during the operational phase over and above the site's extant consent. On that basis, vehicle-related emissions have not been assessed.

Stack Emissions

Pollutant Concentrations

7.3.15 In urban areas, pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of input data, which can include emissions rates, meteorological data and local topographical information. The model used and the input data relevant to this assessment are described in the following sub-sections.

7.3.16 The atmospheric pollutant concentrations in an urban area depend not only on local sources at a street scale, but also on the background pollutant level made up of the local urban-wide background, together with regional pollution and pollution from more remote sources brought in on the incoming air mass. This background contribution needs to be added to the fraction from the modelled sources, and is usually obtained from measurements or estimates of urban background concentrations for the area in locations that are not directly affected by local emissions sources.

Dispersion Model Selection

7.3.17 A number of commercially available dispersion models are able to predict ground level concentrations arising from emissions to atmosphere from elevated point sources. Modelling for this study has been undertaken using ADMS 5, a version of the ADMS (Atmospheric Dispersion Modelling System) developed by Cambridge Environmental Research Consultants (CERC) that models a wide range of buoyant and passive releases to atmosphere either individually or in combination. The model calculates the mean concentration over flat terrain and also allows for the effect of plume rise, complex terrain, buildings and deposition. Dispersion models predict atmospheric concentrations within a set level of confidence and there can be variations in results between models under certain conditions; the ADMS 5 model has been formally validated and is widely used in the UK and internationally for regulatory purposes.

Model Inputs – Meteorological Data

7.3.18 For meteorological data to be suitable for dispersion modelling purposes, a number of meteorological parameters need to be measured on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.

7.3.19 The year of meteorological data that is used for a modelling assessment can have a significant effect on source contribution concentrations. Dispersion model simulations have been performed using five years of data from Charlwood, near Gatwick between 2011 and 2015.

7.3.20 Wind roses have been produced for each of the years of meteorological data used in this assessment and are presented in Figure 7.1.

Model Inputs – Stack Parameters and Emissions

7.3.21 Flue gases are emitted from an elevated stack to allow dispersion and dilution of the residual combustion emissions. The stack needs to be of sufficient height to ensure that pollutant concentrations are acceptable by the time they reach ground level. The stack also needs to be high enough to ensure that releases are not within the aerodynamic influence of nearby buildings, or else wake effects can quickly bring the undiluted plume down to the ground.

7.3.22 A stack height determination has been undertaken to establish the height at which there is minimal additional environmental benefit associated with the cost of further increasing the stack. The Environment Agency removed their detailed guidance, Horizontal Guidance Note EPR H1 (Environment Agency, 2010), for undertaking risk assessments on 1 February 2016; however, the approach used here is consistent with that guidance which required the identification of *"an option that gives acceptable environmental performance but balances costs and benefits of implementing it."*

7.3.23 The stack height determination has focused on identifying the stack height required to overcome the wake effects of nearby buildings. This involved running a series of atmospheric dispersion modelling simulations to predict the ground-level concentrations with the stack at different heights, starting at 50 metres and extending up in 5 metre increments, until a height of 100 metres was reached. The results of the stack height determination are provided in Appendix 7.2. The stack height determination indicated a 95 m stack height was appropriate.

7.3.24 Stack emissions characteristics modelled are provided in Table 7.7 and the mass emissions are provided in Table 7.8.

Table 7.7: Stack Characteristics

Parameter	Unit	Value
Stack height	m	95
Stack location	x, y	517183,134337
Internal diameter	m	2
Efflux velocity	$m.s^{-1}$	21.2
Efflux temperature	^{o}C	140
Actual volumetric flow	$Am^3.s^{-1}$	66.4
Moisture content	%	14
Oxygen content (dry)	%	8.2
Normalised volumetric flow (11% O_2, 0^0C, dry)	$Am^3.s^{-1}$	48.4

Table 7.8: Mass Emissions

Substance	Short-Term Mass Emission ($g.s^{-1}$)	Long-Term(a) Mass Emission ($g.s^{-1}$)
Particles	1.5	0.5
HCl	2.9	0.5
HF	0.2	0.05
SO_2	9.7	2.4
NO_x	19.4	9.7
CO	4.8	2.4
Group 1 Metals Total (b)	-	0.002
Group 2 Metals (c)	-	0.002
Group 3 Metals Total (d)	-	0.024
Dioxins and furans	-	4.8 E-09
PCBs	-	2.4 E-04
PAHs – B[a]P	-	4.8 E-04

Notes:
(a) For averaging periods of 24 hours or greater.
(b) Cadmium (Cd) and thallium (Tl).
(c) Mercury (Hg)

7.3.25 Emission limits in the IED are provided for total particles. For the purposes of this assessment, all particles are assumed to be less than 10 µm in diameter (i.e. PM_{10}). Furthermore, all particles are also assumed to be less than 2.5 µm in diameter (i.e. $PM_{2.5}$). In reality, the PM_{10} and $PM_{2.5}$ concentrations will be a smaller proportion of the total particulate emissions and the $PM_{2.5}$ concentration will be a smaller proportion of the PM_{10} concentration. Therefore, this can be considered a conservative estimate of the likely particulate emissions in each size fraction.

Model Inputs – Terrain

7.3.26 The presence of elevated terrain can significantly affect (usually increase) ground level concentrations of pollutants emitted from elevated sources such as stacks, by reducing the distance between the plume centre line and ground level and by increasing turbulence and, hence, plume mixing. A complex terrain file has been used within the model.

Model Inputs – Surface Roughness

7.3.27 The roughness of the terrain over which a plume passes can have a significant effect on dispersion by altering the velocity profile with height, and the degree of atmospheric turbulence. This is accounted for by a parameter called the surface roughness length.

7.3.28 A surface roughness length of 0.5 m has been used within the model to represent the average surface characteristics across the study area.

Model Inputs – Building Wake Effects

7.3.29 The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level concentrations in the building wakes. Where building heights are greater than about 30 - 40% of the stack height, downwash effects can be significant. The buildings would be covered by a curved roof. Therefore, neighbouring buildings have been grouped together and modelled using the greatest height. The dominant structures (i.e. with the greatest dimensions likely to promote turbulence) included within the model are listed in Table 7.9.

Table 7.9: Dimensions of Buildings Included Within the Dispersion Model

Name	Approx Centre Location		Height (m)	Length (m) / Diameter (m)	Width (m)	Angle (Degrees)
	X (m)	Y (m)				
Boiler Hall	517113	134340	28.9	61	31	90
Turbine Hall/Waste Water Treatment/Compressed Air and Electrical	517118	134305	25.9	51	38	180
Air Cooled Condensers	517160	134321	25.9	69	33	90
Tipping Hall/Bunker/Waste Processing Hall	517058	134339	32.4	89	69	90

Notes: As set above, in some cases neighbouring buildings have been grouped. The table above provides details of the structures that have been modelled and are a reasonable representation of the actual building layout.

Model Outputs – Receptors

7.3.30 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. Such sensitive receptors should be selected where the public is regularly present and likely to be exposed over the averaging period of the objective. LAQM.TG16 (Defra, 2016) provides examples of exposure locations and these are summarised in Table 7.10.

Table 7.10: Example of Where Air Quality Objectives Apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual-mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades or offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the buildings façades), or any other location where public exposure is expected to be short-term.
24-hour mean	All locations where the annual-mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expect to be short-term.
1-hour mean	All locations where the annual and 24-hour mean would apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations to which the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access

7.3.31 The modelling has predicted ground-level concentrations over a grid of 10 km by 10 km, with 100 metre spacing and a grid of 3 km by 3 km, with 30 metre spacing. The grid was centred on the facility stack.

7.3.32 In addition, ground-level concentrations have been modelled at discrete sensitive receptors, selected at representative properties where pollutant concentrations and/or changes in pollutant concentrations are anticipated to be greatest. All such human receptors have been modelled at a height of 1.5 metres, representative of typical head height. The locations of these discrete receptors are listed in Table 7.11 and illustrated in Figure 7.2. In addition, a sensitive receptor within the consented Land at North Horsham development (P10) has been modelled and the receptor at which the greatest impact was predicted in the air quality assessment for the North Horsham development (R4).

Table 7.11: Modelled Sensitive Receptors

Receptor name	X(m)	Y(m)
Station Road 1	517026	133939
Langhurstwood Road 1	517390	134218
Cox Farm	516692	134709
Station Road 2	516539	134061
Langhurstwood Road 2	517422	134569
Langhurstwood Road 3	517491	134043
P10	518981	133573
R4	518942	133347

Model Outputs – NOx to NO_2 Conversion

7.3.33 The NOx emissions will typically comprise approximately 90-95% nitrogen monoxide (NO) and 5-10% nitrogen dioxide (NO_2) at the point of release. The NO oxidises in the atmosphere in the presence of sunlight, ozone and volatile organic compounds to form NO_2, which is the principal concern in terms of environmental health effects.

7.3.34 There are various techniques available for estimating the proportion of NO_X converted to NO_2 by the time it has reached receptors. The methods used in this assessment are discussed below.

Model Outputs – NOx to NO_2 Assumptions for Annual-Mean Calculations

7.3.35 Total conversion (i.e. 100%) of NO to NO_2 is sometimes used for the estimation of the absolute upper limit of the annual mean NO_2. This technique is based on the assumption that all NO emitted is converted to NO_2 before it reaches ground level. However, in reality the conversion is an equilibrium reaction and even at ambient concentrations a proportion of NO_X remains in the form of NO. Total conversion is, therefore, an unrealistic assumption, particularly in the near field (Environment Agency, 2007). While this approach is useful for screening assessments, it is not appropriate for detailed assessments.

7.3.36 Historically, the Environment Agency has recommended that for a 'worst case scenario', a 70% conversion of NO to NO_2 should be considered for calculation of annual average concentrations. If a breach of the annual average NO_2 objective/limit value occurs, the Environment Agency requires a more detailed assessment to be carried out with operators asked to justify the use of percentages lower than 70%.

7.3.37 Following the withdrawal of the Environment Agency's H1 guidance document, there is no longer an explicit recommendation; however, for the purposes of this detailed assessment, a 70% conversion of NO to NO_2 has been assumed for annual average NO_2 concentrations in line with the Environment Agency's historic recommendations.

Model Outputs – NOx to NO_2 Assumptions for Hourly-Mean Calculations

7.3.38 An assumed conversion of 35% follows the Environment Agency's recommendations (Environment Agency, undated) for the calculation of 'worst case scenario' short-term NO_2 concentrations.

Modelling of Long-term and Short-term Emissions

7.3.39 For pollutants where the objective or limit value is measured over a short averaging period (i.e. less than one year), percentiles have been modelled. For instance, the short-term objective for NO_2 is that the hourly-mean concentration should not exceed 200 $\mu g.m^{-3}$ more than 18 times per calendar year. As there are 8,760 hours in a non-leap year, the hourly-mean concentration would need to be below 200 $\mu g.m^{-3}$ in 8,742 hours, i.e. 99.79% of the time. Therefore, the 99.79th percentile of hourly NO_2 has been modelled.

Significance Criteria

7.3.40 The online Environment Agency guidance is for risk assessments and provides details for screening out substances for detailed assessment. In particular, it states that:

"To screen out a PC for any substance so that you don't need to do any further assessment of it, the PC must meet both of the following criteria:

- the short-term PC is less than 10% of the short-term environmental standard
- the long-term PC is less than 1% of the long-term environmental standard

If you meet both of these criteria you don't need to do any further assessment of the substance.

If you don't meet them you need to carry out a second stage of screening to determine the impact of the PEC."

7.3.41 The PEC refers to the Predicted Environmental Concentration calculated as the Process Contribution (PC) added to the ambient concentration. The online Environment Agency guidance continues by stating that:

"You must do detailed modelling for any PECs not screened out as insignificant."

7.3.42 It then states that further action may be required where:

- "your PCs could cause a PEC to exceed an environmental standard (unless the PC is very small compared to other contributors – if you think this is the case contact the Environment Agency)
- the PEC is already exceeding an environmental standard"

7.3.43 On that basis:

- The effects are not considered significant if the short-term PC is less than 10% of the short-term Environmental Assessment Level (EAL);
- The effects are not considered significant if the long-term PC is less than 1% of the long-term EAL; and
- The effects are not considered significant if the PEC is below the EAL.

For the purposes of this assessment, effects that are not considered significant are described as negligible.

Plume Visibility

7.3.44 Visible plumes can arise when hot, wet exhaust gases are cooled to ambient temperature, resulting in the condensation of water vapour and a white plume. The extent of the plume is dependent on the volumetric flow rate of gases from the source, the amount of water vapour in the cooled gases, the relative humidity of the atmosphere and the extent of plume dispersion in the atmosphere.

7.3.45 It is often desirable to recover heat from the exhaust gases for useful energy, rather than rejecting this to the atmosphere. However, issues arise with regard to corrosion once the dew point of the acid gas is reached (at any point in the cooling system) and in resolving a disposal route for the condensed water. There is, therefore, a trade-off between the amount of heat that can be usefully recovered from the exhaust gas stream and the heat required to avoid condensation under all atmospheric conditions.

7.3.46 The likely incidence and dimensions of a visible plume emitted from the proposed stack has been predicted using the ADMS 5 plume visibility module, based on an initial mixing ratio of the plume of 0.102 $kg.kg^{-1}$ (mass of H_2O). Modelling has been undertaken using five years of hourly sequential meteorological data. Resultant data have been used to determine:

- The amount of time that the length of the plume may exceed the average distance to the site boundary; and
- The number of plumes that exceed the average distance to the site boundary during daylight hours.

7.3.47 The Environment Agency no longer provides guidance to determine the significance of plume visibility effects. The historic Horizontal Guidance Note IPPC H1, Environmental Assessment and Appraisal of BAT (Environment Agency *et al.,* 2003) provided a method of quantifying the impact of a plume. This scale is reproduced in Table 7.12.

Table 7.12: Plume Visibility Impact Descriptors

Impact	Quantitative Description
Zero	No visible impacts resulting from operation of process.
Insignificant	Regular small impact from operation of process. Plume length exceeds boundary <5% of daylight hours per year. No local sensitive receptors.
Low	Regular small impact from operation of process. Plume length exceeds boundary <5% of daylight hours per year. Sensitive local receptors.
Medium	Regular large impact from operation of process. Plume length exceeds boundary >5% of daylight hours per year. Sensitive local receptors.
High	Continuous large impact from operation of process. Plume length exceeds boundary >25% of daylight hours per year with obscuration. Local sensitive receptors.

7.3.48 The plume visibility has been assessed using these impact descriptors. The guidance continues by stating that *"Conditions that result in medium or lower impacts can be considered acceptable".* On that basis, the effects are not considered significant.

Fugitive Dust Emissions

7.3.49 There is no formal methodology for assessing the risk of dust impacts from the operation of the facility. The risk of dust impacts has been considered qualitatively using a source-pathway-receptor conceptual model.

Odour Emissions

7.3.50 A qualitative predictive assessment of the potential for odour impact has been carried out using the source-pathway-receptor concept. This approach considers the emission source, the presence of odour controls (both engineering controls and odour management procedures and with the assumption that regulators will properly and effectively enforce these), the prevailing wind direction relative to the locations and distances of the proposed receptors, and their sensitivity to the type of odour in question. This qualitative assessment follows the method in the IAQM (2014b) '*Guidance on the assessment of odour for planning*'. This is described in more detail in Appendix 7.3.

Bioaerosol Emissions

7.3.51 The feedstock is likely to be significantly biologically active only if it contains putrescible material (e.g. rotting food) and exposure is likely to occur only if the material is subject to an activity that creates airborne particles, for example shredding. However, any putrescible material in the feedstock for the facility is unlikely to be in an advanced state of decomposition by the time it reaches the shredding stage. On this basis, bioaerosol emissions are not expected to be significant and are not considered further within this assessment.

7.4 Baseline Conditions

7.4.1 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic. National Planning Practice Guidance and EPUK/IAQM guidance highlight public information from the Department for Environment, Food, and Rural Affairs (Defra) and local monitoring studies as potential sources of information on background air quality. LAQM.TG16 (Defra, 2016) recommends that Defra mapped concentration estimates are used to inform background concentrations in air quality modelling and states that: *"Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality".*

7.4.2 Monitors at urban background locations measure concentrations away from the local influence of emission sources and are therefore broadly representative of residential areas within large conurbations. Monitoring at local urban background locations is considered an appropriate source of data for the purposes of describing baseline air quality for the proposed development site.

7.4.3 For this assessment, the background air quality has been characterised by drawing on information from the following public sources:

- Defra maps, which show estimated pollutant concentrations across the UK in 1 km grid squares;
- Published results of local authority Review and Assessment studies of air quality and Horsham monitoring; and
- Results published by national monitoring networks.

7.4.4 A detailed description of how the baseline air quality has been derived for the proposed development is provided in Appendix 7.4. The background concentrations used in the assessment are set out in Table 7.13.

Table 7.13: Summary of Assumed Background Concentrations

Pollutant	Long-term	Short-term (a)	Data Source
Nitrogen dioxide (NO_2)	11.9 $\mu g.m^{-3}$	23.8 $\mu g.m^{-3}$	Defra mapped
Carbon monoxide (CO)	250 $\mu g.m^{-3}$	500 $\mu g.m^{-3}$	Defra mapped
Particulates (PM_{10})	24.0 $\mu g.m^{-3}$	-	Monitored (Horsham Park Way)
Particulates ($PM_{2.5}$)	11.0 $\mu g.m^{-3}$	-	Defra mapped
Sulphur dioxide (SO_2)	1.57 $\mu g.m^{-3}$	3.14 $\mu g.m^{-3}$	Monitored (Lullington Heath)
Hydrogen chloride (HCl)	0.39 $\mu g.m^{-3}$	-	Monitored (Barcombe Mills)
Hydrogen fluoride (HF)	2.46 $\mu g.m^{-3}$ (b)	2.46 $\mu g.m^{-3}$	EPAQS 2006
Arsenic (As)	0.99 $ng.m^{-3}$	-	Monitored (Lead and Multi-elements Network Maximum Values)
Cadmium (Cd)	0.25 $ng.m^{-3}$	-	
Chromium (Cr)	4.30 $ng.m^{-3}$	-	
Copper (Cu)	15.53 $ng.m^{-3}$	-	
Lead (Pb)	11.24 $ng.m^{-3}$	-	
Manganese (Mn)	5.69 $ng.m^{-3}$	-	
Mercury (Hg)	2.47 $ng.m^{-3}$	-	
Nickel (Ni)	0.88 $ng.m^{-3}$	-	
Vanadium (V)	1.0 $ng.m^{-3}$	-	
Cobalt (Co)	0.12 $ng.m^{-3}$		
Antimony (Sb)	-	-	No local monitoring data available
Thallium (Tl)	-	-	
PAHs	0.23 $ng.m^{-3}$	-	Monitored (PAH Network)
PCBs	64.4 $pg.m^{-3}$		Monitored (Total Organic Micro-pollutants)
Dioxins and Furans	26.7 $fg.m^{-3}$		

Note: (a) Short-term background data approximately equate to the 90th percentile, which is approximately equivalent to 2 x the annual mean.
(b) The HF concentration adopted applies to the short-term averaging period. For conservatism, the same concentration has been adopted for the annual mean.

Future Baseline Conditions

7.4.5 Historically the view has been that background traffic-related NO_2 concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. However, the results of recent monitoring across the UK suggest that background annual-mean NO_2 concentrations have not decreased in line with expectations. To ensure that the assessment presents conservative results, no reduction in the background for any pollutant has been applied for future years.

7.4.6 As set out in Section 7.3 above, modelling has been undertaken for a 10 km by 10 km grid of receptors, centred on the facility stack. All future receptors within the study area have therefore been considered within the assessment. In addition, sensitive receptors within the consented Land at North Horsham development have been explicitly included within the model. The receptors selected are provided in Table 7.11.

7.5 Incorporated Enhancement and Mitigation

Construction Phase

7.5.1 With respect to construction related dust impacts, there is no standardised set of good practice measures. The IAQM assessment methodology has been used to establish the risk associated with the construction phase assuming that no mitigation measures are implemented. The IAQM guidance sets out mitigation measures for low, medium and high dust impact risks. Based on the assessment of dust impacts for the construction phase, as detailed in Section 7.6 of this chapter, the highly recommended measures for medium risk sites are listed below. These measures will be implemented through the Construction Environmental Management Plan (CEMP) to be prepared during the pre-construction period once a Principal Contractor has been appointed.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager; and
- Display the head or regional office contact information.

Dust Management Plan

- Develop and implement a Dust Management Plan (DMP) (which may include measures to control other emissions), approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- Make the complaints log available to the local authority when asked; and
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.

Monitoring

- Carry out regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary;
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; and
- Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. A shorter monitoring period or concurrent upwind and downwind monitoring may be agreed by the local authority.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Use screening intelligently where possible – e.g. locating site offices between potentially dusty activities and the receptors;
- Erect solid screens or barriers around the site boundary;

- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and
- Depending on the duration that stockpiles will be present and their size - cover, seed, fence or water to prevent wind whipping.

<u>Operating vehicle/machinery and sustainable travel</u>

- Ensure all vehicles switch off engines when stationary – no idling vehicles;
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable; and
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

<u>Operations</u>

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible;
- Use enclosed chutes, conveyors and covered skips, where practicable; and
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

<u>Waste management</u>

- Avoid bonfires and burning of waste materials.

<u>Medium risk measures specific to demolition</u>

- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground;
- Avoid explosive blasting, using appropriate manual or mechanical alternatives; and
- Bag and remove any biological debris or damp down such material before demolition.

<u>Medium risk measures specific to construction</u>

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as soon as practicable any material tracked out of the site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Record all inspections of haul routes and any subsequent action in a site log book; and
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.

Medium risk measures specific to trackout

- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as practicable;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site);
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits; and
- Access gates to be located at least 10 metres from receptors where possible.

Operational Phase

7.5.2 For the operational phase, the best way to mitigate against significant adverse effects is to ensure that an appropriate stack height is determined. This assessment includes a stack height determination and results have been presented for the optimum stack height.

7.6 Assessment of Construction Effects

7.6.1 The types of activities that could cause fugitive dust emissions are:

- Demolition;
- Earthworks;
- Handling and disposal of spoil;
- Wind-blown particulate material from stockpiles;
- Handling of loose construction materials; and
- Movement of vehicles, both on and off site.

7.6.2 The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression methods.

7.6.3 The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of proper control, to ensure that dust deposition does not give rise to significant adverse effects, although short-term events may occur (for example, due to technical failure or exceptional weather conditions). The following assessment, using the IAQM methodology, predicts the risk of dust impacts and the level of mitigation that is required to control the residual effects to a level that is “not significant”.

Risk of Dust Impacts

Source

7.6.4 The existing Waste Transfer Building on the site would need to be demolished. The volume is estimated to more than 50,000 m^3. The dust emission magnitude for the demolition phase is classified, using the IAQM dust guidance, as large.

7.6.5 The site area exceeds 10,000 m^2. As such, the dust emission magnitude for the earthworks phase is classified as large.

7.6.6 The total volume of the buildings to be constructed would exceed 100,000 m^3. As such, the dust emission magnitude for the construction phase is classified as large.

7.6.7 The maximum number of outwards movements in any one day is expected to be between 10 and 50 HDVs, the dust emission magnitude for trackout would be classified as medium.

Table 7.14: Dust Emission Magnitude for Demolition, Earthworks, Construction and Trackout

Demolition	Earthworks	Construction	Trackout
Large	Large	Large	Medium

Pathway and Receptor - Sensitivity of the Area

7.6.8 All, earthworks and construction activities are assumed to occur within the site boundary. As such, receptors at distances within 20, 50, 100, 200 and 350 metres of the site boundary have been identified. The sensitivity of the area has been classified and the results are provided in Table 7.15 below.

Table 7.15: Sensitivity of the Surrounding Area for Demolition, Earthworks and Construction

Potential Impact	Sensitivity of Surrounding Area	Reason for Classification
Dust Soiling	Medium	1 – 10 high sensitivity receptors located within 20 m of the site entrance (Appendix 7.1, Table 7.1.4)
Human Health	Medium	1 – 10 high sensitivity receptors located within 20 m of the site entrance and PM_{10} concentrations below 24 - 28 $\mu g.m^{-3}$ (Appendix 7.1, Table 7.1.5)

7.6.9 The Dust Emission Magnitude for trackout is classified as medium and trackout may occur on roads up to 200 metres from the site. The major route within 200 metres of the site is Langhurstwood Road. The sensitivity of the area has been classified and the results are provided in Table 7.16 below.

Table 7.16: Sensitivity of the Surrounding Area for Trackout

Potential Impact	Sensitivity of Surrounding Area	Reason for Classification
Dust Soiling	Medium	1 – 10 high sensitivity receptors located within 20 m of the roads (Appendix 7.1, Table 7.1.4)
Human Health	Medium	1 – 10 high sensitivity receptors located within 20 m of the roads and PM_{10} concentrations 24 - 28 $\mu g.m^{-3}$ (Appendix 7.1, Table 7.1.5)

Overall Dust Risk

7.6.10 The Dust Emission Magnitude has been considered in the context of the sensitivity of the area to give the Dust Impact Risk. Table 7.17 summarises the Dust Impact Risk for the four activities.

Table 7.17: Dust Impact Risk for Earthworks, Construction and Trackout

Dust Source	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Medium	Medium
Human Health	Medium	Medium	Medium	Medium
Risk	Medium	Medium	Medium	Medium

7.6.11 Taking the site as a whole, the overall risk is deemed to be medium. The mitigation measures appropriate to a level of risk for the site as a whole and for each of the phases are committed to as part of the project and are set out in Section 7.5.

7.6.12 Provided this package of mitigation measures is implemented, the residual construction dust effects would not be significant. The IAQM dust guidance states that *"For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'."* The IAQM dust guidance recommends that significance is only assigned to the effect after the activities are considered with mitigation in place.

Accidents and/or Disasters

7.6.13 There are no potential construction accidents/disasters (that could realistically occur) that are relevant to air quality. No significant adverse air quality effects to the environment during the construction phase are anticipated.

7.7 Assessment of Operational Effects

Stack Emissions

7.7.1 For each of the five years of meteorological data (2011 to 2015), the maximum predicted ground-level concentration across the modelled domain has been derived for each substance and is reported below. The maximum predicted ground-level concentrations at the selected sensitive receptors have also been predicted and these are summarised in Appendix 7.5.

Scenario 1: Results (short term emission limits)

7.7.2 Table 7.18 summarises the maximum predicted Process Contribution (PC) to ground-level concentrations for those pollutants with short-term emission limits set out in the IED. The resulting Predicted Environmental Concentrations (PECs) have been calculated by adding the PC to the background Ambient Concentration (AC). The maximum PC and PEC for all points over the modelled grid are reported. The PEC for each pollutant has then been compared with the relevant EAL. If the PC is considered potentially significant, the PEC has been considered. Where the PC is insignificant (i.e. less than 10% of the relevant EAL), there is no need to take the assessment any further. Note that operation at the short term emission limit is very unlikely and the coincidence of such operation with the most adverse meteorological conditions (over five years) is extremely unlikely. This assessment is therefore extremely conservative.

Scenario 2: Results (long term emission limits)

7.7.3 Table 7.19 summarises the PCs and the resulting PECs for all pollutants assuming that the proposed development is operating at long-term emission limits. This repeats the assessment for those pollutants where short term emission limits apply. It should be noted that operation at the long term emission limit is unlikely and the coincidence of such operation with the most adverse meteorological conditions (over five years) is very unlikely. This assessment is therefore also very conservative for both short term and long term emission limits. For long term emission limits, the PEC is considered where the PC exceeds the criterion of 1% of the relevant EAL.

7.7.4 As Horsham District Council has designated two AQMAs due to high levels of NO_2, contour plots for NO_2 have been provided. A contour plot of the 99.79th percentile of hourly-mean NO_2 PCs is shown in Figure 7.3 and a contour plot of the annual-mean NO_2 PCs is shown in Figure 7.4.

Table 7.18: Predicted Maximum Process Contributions at Short-Term Emission Limits

Pollutant	Averaging Period	EAL ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of EAL	Criteria (%)	AC ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	PC is Potentially Significant?	PEC is Potentially Significant?
HCl	1 hour (maximum)	750	7.7	1	10	0.4	8.1	No	-
HF	1 hour (maximum)	160	0.5	0	10	2.5	3.0	No	-
SO_2	15 minute (99.90th percentile)	266	19.2	7	10	3.1	22.3	No	-
	1 hour (99.73th percentile)	350	15.1	4	10	3.1	18.2	No	-
	24 hour (99.18th percentile)	125	4.9	4	10	3.1	8.0	No	-
NO_2	1 hour (99.79th percentile)	200	11.5	6	10	23.8	35.3	No	-

Table 7.19: Predicted Maximum Process Contributions ($\mu g.m^{-3}$) at Long-Term Emission Limits

Pollutant	Averaging Period	EAL ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of EAL	Criteria (%)	AC ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	PC is Potentially Significant?	PEC is Potentially Significant?
PM_{10}	24 hour (90.41st percentile)	50	0.1	0	10	24.0	24.1	No	-
	24 hour (annual mean)	40	0.04	0	1	24.0	24.0	No	-
$PM_{2.5}$	24 hour (annual mean)	25	0.04	0	1	11.0	11.0	No	-
HCl	1 hour (maximum)	750	1.3	0	10	0.4	1.7	No	-
HF	1 hour (maximum)	160	0.1	0	10	2.5	2.6	No	-
SO_2	15 minute (99.90th percentile)	266	4.8	2	10	3.1	7.9	No	-
	1 hour (99.73th percentile)	350	3.8	1	10	3.1	6.9	No	-
	24 hour (99.18th percentile)	125	1.2	1	10	3.1	4.4	No	-
	1 hour (annual mean)	50	0.2	0	1	1.6	1.8	No	-
NO_2	1 hour (99.79th percentile)	200	5.8	3	10	23.8	29.6	No	-
	1 hour (annual mean)	40	0.6	1	1	11.9	12.5	No	-
CO	8 hour (maximum daily running)	10,000	4.6	0	10	500.0	504.6	No	-
Cd	1 hour (annual mean)	0.005	0.0002	4	10	0.00025	0.00045	No	-
Tl	1 hour (maximum)	30	0.0064	0	10	-		No	-
	1 hour (annual mean)	1	0.0002	0	1	-		No	-
Hg	1 hour (maximum)	7.5	0.0064	0	10	0.00247	0.00888	No	-

Pollutant	Averaging Period	EAL (µg.m-3)	Max PC (µg.m-3)	Max PC as % of EAL	Criteria (%)	AC (µg.m-3)	PEC (µg.m-3)	PC is Potentially Significant?	PEC is Potentially Significant?
	1 hour (annual mean)	0.25	0.0002	0	1	0.00247	0.00267	No	-
Sb	1 hour (maximum)	150	0.0641	0	10	-		No	-
	1 hour (annual mean)	5	0.0020	0	1	-		No	-
As	1 hour (annual mean)	0.003	0.0020	67	1	0.00099	0.00299	Yes	No
Cr	1 hour (maximum)	150	0.0641	0	10	0.00430	0.06843	No	-
	1 hour (annual mean)	5	0.0020	0	1	0.00430	0.00630	No	-
Co	1 hour (maximum)	6	0.0641	1	10	0.00012	0.06425	No	-
	1 hour (annual mean)	0.2	0.0020	1	1	0.00012	0.00212	No	-
Cu	1 hour (maximum)	200	0.0641	0	10	0.01553	0.07966	No	-
	1 hour (annual mean)	10	0.0020	0	1	0.01553	0.01753	No	-
Pb	1 hour (annual mean)	0.25	0.0020	1	1	0.01124	0.01324	No	-
Mn	1 hour (maximum)	1500	0.0641	0	10	0.00569	0.06982	No	-
	1 hour (annual mean)	0.15	0.0020	1	1	0.00569	0.00769	No	-
Ni	1 hour (annual mean)	0.02	0.0020	10	1	0.00088	0.00288	Yes	No
V	1 hour (maximum)	5	0.0641	1	10	0.00100	0.06513	No	-
	1 hour (annual mean)	1	0.0020	0	1	0.00100	0.00300	No	-
Dioxins & Furans	1 hour (annual mean)	-	3.99E-10		1	2.67E-08	2.71E-08	-	-
PAHs	1 hour (annual mean)	0.0003	3.99E-05	16.0	1	2.30E-04	2.70E-04	Yes	Yes
PCB	1 hour (annual mean)	0.2	2.00E-05	0.0	1	6.44E-05	8.44E-05	No	-

7.7.5 The results presented in Table 7.18 show that the predicted PC is below 10% of the relevant EAL for all pollutants. At short-term emission limits, the effects are therefore not considered significant.

7.7.6 The results presented in Table 7.19 show that the predicted PC is below 10% of the relevant short-term EAL for all pollutants except As and Ni; however, in both cases the PEC is below the EAL.

7.7.7 The results presented in Table 7.19 show that the predicted PC is below 1% of the relevant long-term EAL for all pollutants with the exception of PAHs. Appendix 7.5 shows that, at the nearest sensitive receptors, the PEC is below the EAL and the long-term PAH effect is not considered to be significant.

7.7.8 For hexavalent chromium (Cr^{VI}), the measured concentrations in the Environment Agency document '*Releases from waste incinerators – Guidance on assessing group 3 metal stack emissions from incinerators'* version 4 (undated), varies from 0.0005% to 0.03% of the IED emission concentration limit. Table 7.20 shows the predicted PC at these proportions.

Table 7.20: Predicted Maximum Cr^{VI} Process Contributions (µg.m^{-3}) at Long-Term Emission Limits

Pollutant	Averaging Period	EAL (µg.m^{-3})	Max PC (µg.m^{-3})	Max PC as % of EAL	Percentage of the IED Emission Limit
Cr^{VI}	1 hour (annual mean)	0.0002	9.98E-09	0	0.0005% (min)
			5.99E-07	0	0.03% (max)

7.7.9 The PC at each end of the range is below 1% of the EAL and the effects are not considered significant.

7.7.10 Table 7.21 provides the maximum predicted metal deposition rates.

Table 7.21: Maximum Metal Deposition (mg.m^{-2}.day^{-1}) at Long-Term Emission Limits

Pollutant	Deposition Rate (mg.m^{-2}.day^{-1})		Deposition as % of EAL
	Maximum	Predicted	
Cd	0.009	0.0005	5.7
Hg	0.004	0.0005	12.9
As	0.02	0.0052	25.9
Cr	1.5	0.0052	0.3
Cu	0.25	0.0052	2.1
Pb	1.1	0.0052	0.5
Ni	0.11	0.0052	4.7

7.7.11 The results presented in Table 7.21 show that the predicted metal deposition rate is above 1% of the EAL for Cd, Hg, As, Cu and Ni. Appendix 7.5 shows that, at the nearest sensitive receptors, the long-term effect is not considered to be significant. It should be noted that the preferred method of control for all of the metals listed is to prevent their entry into the waste stream, primarily through product design and then through segregated waste management. The 3Rs Facility would be designed to control emissions from the waste composition expected in typical non-hazardous commercial and industrial waste streams (equivalent to non-hazardous municipal waste).

Plume Visibility

7.7.12 Table 7.22 provides a summary of the results of plume visibility modelling.

Table 7.22: Summary of Plume Visibility Results

Year of Met Data	Number of visible plumes	Percentage of year that a visible plume is predicted	Maximum plume length (m)	Averag e plume length (m)	Number of hours plume visible outside site boundary during daylight hours	Percentage of year visible plumes are outside site boundary during daylight hours
2011	197	2.2	155	1	14	0.4
2012	368	4.2	177	1	15	0.4
2013	533	6.1	376	4	72	1.9
2014	174	2.0	151	1	15	0.4
2015	152	1.7	222	1	12	0.3

7.7.13 Based on modelled results using five years of hourly sequential meteorological data, a plume is predicted to be visible outside the site boundary less than 5% of daylight hours in each of the five years modelled. As there are local sensitive receptors, using the impact descriptors adopted for the assessment, the impact is considered 'low' and can be considered 'acceptable'. An occasional visible plume is quite normal for combustion processes which generate energy by conversion of chemical energy with the main combustion products being water (vapour) and carbon dioxide. Plume visibility is effectively controlled in energy recovery facilities such as the 3Rs Facility being dictated primarily by the temperature at which the reagent reaction (lime or sodium bicarbonate with acid gas) is optimised with the aim of maximising energy efficiency as in conventional domestic boilers). Water vapour plume visibility is considered further in the visual impact assessment, but as can be seen from Table 7.22, visible water vapour plumes cannot be described as frequent, long, or unacceptable. Effects are not therefore considered to be significant.

Dust Emissions

7.7.14 The operation of the proposed facility could potentially be associated with dust. Some of the key activities likely to generate dust during the operation of the proposed facility are:

- Delivery of waste; and
- Sorting and handling of waste.

7.7.15 Upon arrival at the facility, the delivered material would be weighed and recorded. After passing over the weighbridge, the material would be delivered to the reception building where it would be put into buffer storage. It would then be screened and inert materials (rubble and glass), polyvinyl chloride (PVC) and metals would be recovered. The separated recyclable materials would be stored and bulked on the site prior to export for re-use or recovery elsewhere. The residual material would be shredded within the main processing building, prior to thermal treatment.

7.7.16 The process would produce residues in the form of bottom ash and boiler ash and air pollution control residue which would be collected and removed from the site for further treatment off-site.

7.7.17 The main thermal treatment process would be fully enclosed.

7.7.18 There are dedicated areas for the reception and storage of imported material, which together with the processing and materials separation are all contained within a controlled environment.

7.7.19 The accepted best practice approach for the primary control of dust releases is containment within the building, which is the technique employed for the 3Rs Facility. Air from within the waste reception hall and waste processing hall would be drawn for use as combustion air and the dust levels inside would be managed so as to comply with health and safety obligations for personal exposure. The only materials stored outside would be inert, comprising ferrous and non-ferrous metals, and PVC plastic with little potential to generate dust. Based on the above, the magnitude of the source of emissions is considered to be small.

7.7.20 The wind roses illustrated in Figure 7.1 show that the prevailing wind direction is south westerly. The nearest high sensitive receptors are residential properties on Langhurstwood Road (to the east and north east of the site) and Station Road (to the south). The properties on Station Road are upwind of the site and, at 430 metres, remote from potential sources of emissions. The properties on Langhurstwood Road are downwind of the site; the closest of which is 240 metres to the east. On that basis, the risk of dust impacts from the process is considered to be very low. No significant effects are anticipated.

Odour Emissions

Source Odour Potential

7.7.21 The first step in the qualitative assessment of odour impact is to estimate the odour source potential which has been determined based on the guidance set out in Appendix 7.3.

7.7.22 Waste delivered to the proposed development would be unloaded within the reception building. Therefore, the potential for odours during the delivery stage and storage stages would be minimal.

7.7.23 Defra published a *"Review of Environmental and Health Effects of Waste Management"* (Defra, 2004). This publication included a literature review, which revealed that odour is potentially significant from the waste storage and processing phases of incineration, but that odours are normally controlled via the combustion air. Combustion air for the plant would be drawn from within the buildings creating a slight negative pressure ensuring that airflow and, therefore, odours are likely to be directed into rather than out of the building. The height of the stack and the destruction of odours during the incineration process are sufficient to ensure that it is unlikely that odours from the stack would be detectable at ground level. On that basis, the Source Odour Potential has categorised as 'small'.

Pathway Effectiveness

7.7.24 The odour flux from the odour sources is dependent on the effectiveness of odour transport to the receptors, versus the mitigating effect of dilution/dispersion in the atmosphere.

7.7.25 The wind roses illustrated in Figure 7.1 show that the prevailing wind direction is south westerly.

Risk of Odour Exposure (Impact)

7.7.26 When the small Source Odour Potential (ignoring mitigation) is considered in the context of the pathway effectiveness (Appendix 7.3, Table 7.3.3), the risk of odour exposure (impact) is negligible at all receptors.

Likely Magnitude of Odour Effect

7.7.27 When the above risk of odour exposure impact is considered in the context of the sensitivity of the receptors using the matrix in Appendix 7.3, Table 7.3.4, the likely resulting odour effect is summarised in Table 7.23.

Table 7.23: Likely Odour Effects at the Proposed Development Site

Receptor	Source Odour Potential	Pathway Effectiveness	Risk Odour Exposure	Receptor Sensitivity	Likely Odour Effect
Station Road (430m to the south - upwind)	Small	Ineffective	Negligible Risk	High	Negligible Effect
Langhurstwood Road (240 m to the south east)	Small	Ineffective	Negligible Risk	High	Negligible Effect
Langhurstwood Road (320 m to the north east - downwind)	Small	Moderately Effective	Negligible Risk	High	Negligible Effect

7.7.28 The likely resulting odour effect would be “negligible”. Overall, the effect is considered to be “negligible” and would not be significant.

Accidents and/or Disasters

7.7.29 There are no potential operational accidents/disasters (that could realistically occur) that are relevant to air quality. No significant adverse air quality effects on the environment during the operational phase are anticipated.

Potential Changes to the Assessment as a Result of Climate Change

7.7.30 The dispersion modelling of operational effects has been undertaken for five years of hourly meteorological conditions. The assessment therefore already takes into account a wide range of ambient temperatures. The assessment has been undertaken using the relevant technical guidance and based on current knowledge, the results of the assessment are not expected to be affected by climate change.

7.8 Assessment of Decommissioning Effects

7.8.1 The risk of impacts on decommissioning is expected to be the same as those during construction. Therefore, there are not anticipated to be any significant effects during this phase.

7.9 Assessment of Cumulative Effects

7.9.1 A review of proposed or possible future third party projects that may have a cumulative impact with the development proposals has been undertaken and used to inform this ES. The projects identified are summarised in Appendix 4.4.

7.9.2 In relation to air quality effects, the following developments have been identified as having the potential to interact cumulatively with the proposed 3Rs Facility and have therefore been examined as part of the assessment:

- Brookhurst Wood Landfill Site;
- Brookhurst Wood Mechanical Biological Treatment (MBT) Facility;

- Brookhurst Refuse Derived Fuel (RDF) Facility; and
- Land North of Horsham.

7.9.3 During the construction phase, cumulative effects are only likely to occur in the area where two or more proposed developments are within 700 metres of each other; and then only for receptors within 350 metres of both developments. Cumulative effects would then only be experienced if construction works on both schemes were to take place simultaneously. The consented North Horsham scheme is such a scheme. Effective implementation of relevant mitigation measures at both sites should ensure the risk of cumulative dust effects is minimal and as a result no significant effects are anticipated during the construction phase. Cumulative effects are assessed as 'negligible' and "not significant".

7.9.4 For the operational phase, background concentrations have been derived following a comparison of data from available sources, including Defra maps. For each pollutant, a conservative but representative concentration has been selected. For NO_2, CO and $PM_{2.5}$, data from the Defra maps has been used. No sources have been deducted from the Defra mapped concentrations. For PM_{10}, the nearest monitor measured higher concentrations than the Defra maps and the highest monitored concentration has been used instead.

Brookhurst Wood Landfill Site

7.9.5 The National Atmospheric Emissions Inventory (NAEI) provides a list of the operators and sites with point source emissions included within the data that underpins the Defra maps. The Brookhurst Wood operators are listed as Biffa Waste Services Limited and UK Waste Management Limited. The data reported by the NAEI includes emissions of NOx, PM_{10} and $PM_{2.5.}$ Emissions from road vehicles using the site are also included within the Defra mapped concentrations. Emissions from operations at the Brookhurst Wood Landfill Site are therefore already taken into account to the extent that associated concentrations are included within the background concentrations adopted for the assessment.

Brookhurst Wood RDF

7.9.6 No air quality assessment was submitted in support of the refuse derived fuel compacting and baling facility at Brookhurst Wood, indicating that the air quality effects are not expected to be significant. The 2013 Design and Access Statement (Crowther Associates, 2013) submitted to accompany the planning application considers odour and dust impacts.

7.9.7 An odour assessment was not undertaken; however, no food waste would be accepted at the facility and unacceptable odours are not anticipated. A dust assessment was also not undertaken; however, the applicant advises that odour and dust mitigation measures would be agreed by the successful waste operator as part of the licence.

Brookhurst Wood MBT Facility and Land at North Horsham

7.9.8 The Brookhurst Wood MBT facility commenced accepting waste in July 2014. The engines combusting gas produced by the anaerobic digestion process, emit 0.46 g/s of NOx and 0.29 g/s of SO_2 from a 15 m stack (Jacobs, 2008). Using dispersion factors for a 15 metre stack available at the Environment Agency (2016) document, the maximum process contribution has been estimated.

7.9.9 The Air Quality chapter in the Environmental Statement (Liberty Property Trust, 2016)) for the Land at North Horsham development identified the key air quality concerns during the operational phase as traffic-related emissions. The chapter presents the predicted change in NO_2, PM_{10} and $PM_{2.5}$ concentrations at a number of representative sensitive receptors in 2031, the year in which the development is expected to be fully operational.

7.9.10 The contribution from each of the developments has been combined with the relevant PC for the 3Rs Facility to determine the likely cumulative PEC. The results are summarised in Table 7.24.

Table 7.24: Summary of Cumulative Impacts

Pollutant	Averaging Period	Concentrations in $\mu g.m^{-3}$					
		EAL	Maximum PC - Proposed Wealden Facility	Maximum PC – Land at North Horsham	Maximum PC – Brookhurst Wood MBT	AC	PEC
PM_{10}	24 hour (annual mean)	40	0.04	0.3	-	24	24.34
$PM_{2.5}$	24 hour (annual mean)	25	0.04	0.2	-	11	11.2
NO_2	1 hour (annual mean)	40	0.6	1.6	5.9	11.9	20.0
SO_2	1 hour (annual mean)	50	0.2	-	5.3	1.57	7.1

7.9.11 The Environment Agency dispersion factors used to estimate the PC for the Brookhurst Wood gas engines are deliberately conservative. Furthermore, the analysis assumes that the location of the maximum impacts from the proposed development coincide with the location of the maximum impact from the Brookhurst Wood gas engines, which is highly unlikely to be the case.

7.9.12 The results show that the cumulative PEC remains well below the relevant EAL. Even with highly conservative assumptions, the cumulative effects are not considered significant. The impacts calculated for the proposed 3Rs Facility are much lower than those predicted for Land North of Horsham or Brookhurst Wood MBT (noting that the latter uses the conservative Environment Agency dispersion factors).

7.10 Inter-relationships

7.10.1 Arrivals at and departures from the project site may change the number, type and speed of vehicles using the local road network. Changes in road vehicle emissions can affect air quality; however, in this case the effects are not considered significant. Chapter 6: Traffic and Transport provides the detailed analysis of vehicle movements generated by the construction and operation of the development.

7.11 Limitations of the Assessment

7.11.1 The assessment has limitations and uncertainties in a number of areas including:

- Overall limitations of the model algorithms - No dispersion model is wholly accurate and all models will produce variations in results under certain conditions. However, the model used in the assessment has been extensively validated and the full set of model validation documents is available on CERC's web site. Dispersion models typically have an accepted uncertainty of up to +/-25% and this is taken into account when devising the criteria for establishing significance.
- Estimates of background concentrations - The background concentrations have been derived from a number of available sources. Where appropriate, the highest concentration has been used in the assessment. The conservative assumptions adopted ensure that the background concentration used within the model is towards the top of the uncertainty range, rather than a central estimate;

- Meteorological data uncertainties - Five years of hourly sequential meteorological data have been used in the assessment ensuring that a wide range of potential meteorological conditions have been accounted for in the assessment; and
- Stack emissions - The modelling has been undertaken assuming that the stack emissions are released at the IED emissions concentrations limit. In reality, emissions concentrations are likely to be lower.

7.11.2 On the basis of the above, the results of the assessment should be considered conservative.

7.12 Further Mitigation Measures

Construction and Demolition

7.12.1 As set out in Sections 7.5 and 7.6, the proposed development includes a commitment to implement dust control measures based on those identified in the IAQM guidance (IAQM, 2014a) for medium risk sites. These would be implemented through the Construction Environmental Management Plan.

7.12.2 The IAQM dust guidance states that with the recommended dust mitigation measures in place the residual effect will normally be "not significant", and recommends the mitigation is secured by for example planning conditions, a legal obligation, or by legislation. No further mitigation measures are therefore required.

Operation

7.12.3 The effects during operation are not considered to be significant. As such, no further mitigation has been identified.

7.13 Monitoring and Management Strategies

Construction

7.13.1 Regular site inspections to monitor compliance with the DMP would be carried out with inspection results recorded in a log that would be made available to the local authority on request.

7.13.2 The frequency of site inspections by the person accountable for air quality and dust issues on site would need to be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

7.13.3 The requirement for dust deposition, dust flux and/or real-time PM_{10} continuous monitoring would be agreed with the Local Authority prior to the commencement of construction works.

Operation

7.13.4 Stack emissions monitoring will be required to demonstrate compliance with the terms of the Environmental Permit. The permit will set out details of the type of monitoring and the frequency of data collection and reporting.

7.14 Residual Effects

7.14.1 Table 7.25 summarises the significance of effects for the construction and the operational phase for the project taking into account the mitigation measures incorporated into the development proposals.

Table 7.25: Summary of Likely Environmental Effects on Air Quality and Odour

Parameter	Sensitivity of receptor	Likely impact	Duration	Magnitude of impact	Significance of effect	Mitigation	Magnitude of Residual Impact	Significance of Residual Effect	Significant
A range of receptors within 350 m of the site boundary	Receptors considered range from low to high sensitivity	Suspended particulate matter and deposited dust.	Medium-term	Risk - Medium	Guidance does not allow significance of effect to be determined before mitigation.	Suite of measures set out in the IAQM dust guidance	Guidance does not allow the magnitude of the impact risk to be determined after mitigation, specifying only that the resultant effect will not be significant.	Negligible	No
Grid of receptors 10 km by 10 km with 100 m spacing and 3 km by 3 km with 30 m spacing	Assumed to be high.	Increased atmospheric pollutant concentrations and metal deposition.	Long-term	Small	Negligible	None	Negligible	Negligible	No
Representative receptors	High	Dust	Long-term	Small	Negligible	None	Negligible	Negligible	No
Representative receptors	High	Odour	Long-term	Small	Negligible	None	Negligible	Negligible	No
Grid of receptors 10 km by 10 km with 100 m spacing	Assumed to be high.	Visible plume	Long-term	Small	Negligible	None	Negligible	Negligible	No

7.15 Conclusions

7.15.1 A detailed air quality assessment predicting the potential effects of emissions generated during the construction and operation of the facility has been undertaken.

7.15.2 Impacts during the construction, such as dust generation and plant vehicle emissions, are predicted to be of short duration and only relevant during the construction phase. The results of the risk assessment of construction dust impacts undertaken using the IAQM dust guidance, indicate that before the implementation of mitigation and controls, the risk of dust impacts will be medium. Implementation of the highly-recommended mitigation measures described in the IAQM construction dust guidance is likely to reduce the residual dust effects to a level categorised as “not significant”.

7.15.3 The number of vehicle movements generated by construction activities is below the threshold criteria for requiring an assessment. The effects due to emissions from construction-related vehicle emissions are therefore considered to be “not significant”. Emissions from the thermal treatment of waste have been assessed through detailed dispersion modelling using best practice approaches. The assessment has been undertaken based on a number of conservative assumptions. This is likely to result in an over-estimate of the contributions that will arise in practice from the facility. The results of dispersion modelling reported in this assessment indicate that predicted contributions and resultant environmental concentrations of all pollutants considered would be of ‘negligible’ significance.

7.15.4 A visible plume extending beyond the site boundary is predicted for less than 5% of daylight hours in each of the five years modelled. Using the impact descriptors adopted for the assessment, the impact is considered ‘low’ and the plume visibility is considered to be ‘acceptable’.

7.15.5 There would be no change in HGV movements during the operational phase over and above the site’s extant consent. On that basis, vehicle-related emissions have not been assessed and the effects from operational-vehicle emissions are not considered to be significant.

7.15.6 The main dust mitigation measure is containment. Taking into account the fact that the process would be largely contained and the relative distance to sensitive receptors, the risk of dust impacts during operation is predicted to be insignificant based on professional judgement.

7.15.7 The risk of odour impacts has been assessed qualitatively using a source-pathway-receptor conceptual model. The likely odour effect is negligible.

7.15.8 Overall the effects of the facility are not considered to be significant.

7.16 References

Legislation

Council Directive 2006/12/EC European Parliament and of the Council of 5 April 2006 on Waste

Council Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe.

Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

Directive 2010/75/EC of The European Parliament And Of The Council of 24 November 2010 on industrial emissions

Directive 1996/61/EC of 24 September 1996 concerning Integrated Pollution Prevention and Control

The Environmental Permitting (England and Wales) Regulations 2016

The Air Quality Standards (England) Regulations.

Published Documents

British Standard Institute (1983) BS 6069:Part 2:1983, ISO 4225-1980 Characterization of Air Quality. Glossary.

Crowther Associates (2013) Design and Access Statement: For a New Refuse Derived Fuel Compacting and Baling Facility at Site Ha, former Brickworks, Brookhurst Wood, Langhurstwood Road, Warnham.

Defra (2004) Review of Environmental and Health Effects of Waste Management.

Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 2.

Defra (2016) Local Air Quality Management Technical Guidance, 2016 (LAQM.TG16).

Department for Communities and Local Government (DCLG) (2012) National Planning Policy Framework.

Department for Communities and Local Government (DCLG) (2014a) National Planning Policy for Waste.

DCLG (2014b) Planning Practice Guidance. https://www.gov.uk/guidance/air-quality--3

Environment Agency (2007) Review of Methods for NO to NO_2 Conversion in Plumes at Short Ranges.

Environment Agency (2010) Environmental Permitting Regulations (EPR) – H1 Environmental Risk Assessment, Annex K.

Environment Agency (2016) Environmental Management – Guidance. Air Emissions Risk Assessment for your Environmental Permit. https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions.

Environment Agency (undated) Conversion Ratios for NO_x and NO_2..

Environment Agency (undated) Releases from Waste Incinerators – Guidance on Assessing Group 3 Metal Stack Emissions from Incinerators Version 4.

Environment Agency, Environment and Heritage Service (Northern Ireland) and Scottish Environmental Protection Agency (2003) Integrated Pollution Prevention and Control (IPPC) Environmental Assessment and Appraisal of BAT.

EPUK/IAQM (2015) Land-Use Planning & Development Control: Planning for Air Quality.

Expert Panel on Air Quality Standards (2006) Guidelines for Halogens and Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects.

Horsham District Council (2015) Horsham District Planning Framework (excluding South Downs National Park).

IAQM (2014a) Guidance on the Assessment of Dust from Demolition and Construction.

IAQM (2014b) Guidance on the Assessment of Odour for Planning.

Jacobs (2008) Atmospheric Dispersion Modelling of Potential Anaerobic Digestion and Energy from Waste Plants

Liberty Property Trust (July 2016) Land North of Horsham Environmental Statement

WHO (2005) Air Quality Guidelines: Global Update 2005.

West Sussex County Council and South Downs National Park Authority (2014) West Sussex Waste Local Plan. April 2014.