11 AIR QUALITY

11.1 Introduction

11.1.1 This chapter of the Environmental Statement (ES) assesses the likely significant air quality effects resulting from the Redcar Energy Centre (REC).

11.1.2 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 and emissions from on-site construction plant; and
- operational effects (from the REC) – potential air quality effects from the thermal treatment stack; potential fugitive emissions and dust.

11.1.3 The effect of odour impacts from the operation of the REC is not considered significant and an assessment has been scoped out. An assessment of emissions from construction and operational traffic has also been scoped out. Details are provided in Table 11.7.

11.1.4 The effect of bioaerosol emissions from the REC is also not expected to be significant as no putrescible wastes would be accepted at the Materials Recycling Facility (MRF) see Chapter 2 (Project Description). On this basis, the assessment of bioaerosol emissions has been scoped out of the ES.

11.2 Assessment Methodology

Legislation, Guidance and Planning Context

Legislation and Guidance

Industrial Emissions Directive Limits

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

11.2.2 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.

11.2.3 For the purposes of this assessment and for those pollutants having only one emission limit (for a single averaging period), the proposed development 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 11.1.

Table 11.1 : Relevant Industrial Emissions 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 (NOx)	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)

All concentrations are 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).

11.2.4 Ammonia (NH_3), polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) expressed as benzo(a)pyrene equivalent (B[a]P) are not specifically regulated under the IED. For the purposes of this assessment, the emission concentrations in Table 11.2 have been used for these pollutants to calculate long-term (greater than 24-hour average) mean ground-level concentrations (Scenario 2).

Table 11.2: Modelled Emission Concentrations for Non-IED regulated Pollutants

Pollutant	Scenario 2 Emission Concentrations ($mg.Nm^{-3}$)
Ammonia (NH_3)	10
PCBs	0.005
PAHs (as B[a]P equivalent)	0.003

All concentrations are referenced to temperature 273 K, pressure 101.3 kPa, 11% oxygen, dry gas.

Emission concentrations for NH_3 and PCBs obtained from the IPPC Reference Document on the Best Available Techniques for Waste Incineration (August 2006). These emission concentrations are considered to be conservative as the Commission Implementing Decision (EU) 2019.2010 of 12 November 2019 reference document includes updated emission concentrations where concentrations are generally lower.

Emission concentration for PAHs taken from Figure 8.119 of the Best Available Techniques (BAT) Reference Document on Waste Incineration (2019).

BAT Conclusions – Emissions Levels

11.2.5 The plant would be designed and operated in accordance with the '*Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusion, under Directive 2010/75/EU of the European Parliament and of the Council for waste incineration*', hereafter referred to as 'BAT conclusions'. The BAT conclusions establish emission levels associated with best available techniques (BAT-AELs), and a provided in Table 11.3.

Table 11.3: BAT-Associated Emission Levels (BAT-AELs)

Pollutant	BAT-AELs (mg.Nm^3)
Particles	5
Hydrogen chloride (HCl)	6
Hydrogen fluoride (HF)	1
Sulphur dioxide (SO_2)	30
Nitrogen oxides (NOx)	120
Carbon monoxide (CO)	50
Group 1 metals (a)	0.02 (d)
Group 2 metals (b)	0.02 (d)
Group 3 metals (c)	0.3 (d)
Dioxins and furans	0.00000004 (e)
PCBs	0.00000006 (d)
PAHs	0.003 (d)
Ammonia	10

All concentrations are 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).

Ambient Air Quality Criteria

11.2.6 There are several EU Air Quality Directives and UK Air Quality Regulations (Defra, 2010) that would apply to the operation of the proposed development. These provide a series of statutory air quality limit values, target values and objectives for pollutants, emissions of which are regulated through the IED.

11.2.7 There are some pollutants whose emission levels are regulated by the IED but which do not have statutory ambient air quality standards prescribed under current legislation. For these pollutants, a number of non-statutory ambient air quality objectives and guidelines exist that have been applied within this assessment. The Environment Agency provides further assessment criteria in its online guidance (Defra and Environment Agency, 2016).

Air Quality Directive and Air Quality Standards Regulations

11.2.8 The 2008 Ambient Air Quality Directive (Council 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 $PM_{2.5}$[1]),
- nitrogen dioxide (NO_2),
- sulphur dioxide (SO_2),
- ozone (O_3),
- carbon monoxide (CO),
- lead (Pb) and
- benzene.

11.2.9 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 (Defra, 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 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 ambient limit values are listed in Table 11.4.

Table 11.4: 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 (Pb)	Annual	0.25 $\mu g.m^{-3}$	-
Arsenic (As)	Annual	0.006 $\mu g.m^{-3}$	-

[1] PM_{10} = Particulate matter with a diameter up to 10 µm. $PM_{2.5}$ = Particulate matter with a diameter up to 2.5 µm.

Pollutant	Averaging Period	Limit Values	Not to be Exceeded More Than
Cadmium (Cd)	Annual	0.005 μg.m^{-3}	-
Nickel (Ni)	Annual	0.02 μg.m^{-3}	-

* per calendar year

Non-Statutory Air Quality Objectives and Guidelines

11.2.10 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 AQS was published in 1997 and has been revised several times since, with the latest published in 2007 (Defra, 2007). The AQS 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 referenced above.

11.2.11 The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), which requires local authorities to go through a process of review and assessment of air quality in their areas, identifying places where objectives are not likely to be met, then declaring Air Quality Management Areas (AQMAs) and putting in place Air Quality Action Plans to improve air quality. These plans also contribute, at local level, to the achievement of EU limit values.

11.2.12 Non-statutory ambient 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, 2005). The non-statutory ambient objectives and guidelines are presented in Table 11.5.

Table 11.5: Non-Statutory Air Quality Objectives and Guidelines

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

(a) Target date set in UK Air Quality Strategy 2007

(b) World Health Organisation Guidelines

(c) EPAQS recommended guideline values

11.2.13 On 14 January 2019, Defra published the *'Clean Air Strategy 2019'.* The report sets out actions that the Government intends to take to reduce emissions from transport, in the home, from farming and from industry.

Environmental Assessment Levels

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

11.2.15 Table 11.6 presents all available EALs for ambient concentrations of the pollutants relevant to this assessment.

Table 11.6: 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	266
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	-
Ammonia (NH_3)	5	-

In Table 10.6, (a) refers to EALs obtained from the EA's earlier Horizontal Guidance Note EPR H1 (Environment Agency, 2010) as no levels are provided in the current guidance.

11.2.16 For the purpose of this assessment, the statutory ambient air quality limit and target values (as presented in Table 11.4) 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, this assessment assumes the lower of either the EAL or the non-statutory air quality objective or guideline where they exist.

Environmental Permitting Regulations

11.2.17 The IED applies an integrated environmental approach to the regulation of certain industrial activities. The Environmental Permitting Regulations (EPR) 2016 (as amended) implement the IED relating to installations in England. The Regulations define activities that require an Environmental Permit from the Environment Agency .

11.2.18 EPR 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 IED 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.

11.2.19 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.

11.2.20 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 EU Air Quality Limit Values may be exceeded by an existing operator.

11.2.21 The assessment of air quality effects for the proposed REC is consistent with the Environment Agency's on-line guidance entitled '*Environmental management – guidance, Air emissions risk assessment for your environmental permit*' (Defra and Environment Agency, 2016) provides guidelines for air dispersion modelling.

Planning Policy Context

11.2.22 The following planning policy documents are relevant to this assessment:

- National Planning Policy Framework (NPPF) (Ministry for Housing, Communities and Local Government, 2019);
- National Planning Practice Guidance (NPPG) (Ministry for Housing, Communities and Local Government, 2014 as amended); and
- Redcar and Cleveland Borough Council (RCBC) Local Plan (May 2018)

11.2.23 Details of these policies and how they relate to this chapter are provided in Appendix 11.1.

Study Area

11.2.24 The air quality study area is different for the assessment of the construction and operational phases. The study area in each case is described in detail within the methodology that follows, referencing the relevant guidance documents.

11.2.25 In overview, the study area for construction phase dust impacts is up to 350 metres from the Application Site boundary and roads up to 500 metres from the site entrance. For stack emissions during operation, the study area is up to 10 km for ecological receptors and 3 km for human-health receptors.

Baseline Methodology

11.2.26 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. NPPG and Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance highlight public information from Defra and local monitoring studies as potential sources of information on background air quality. LAQM Technical Guidance: LAQM.TG16 (Defra, 2016b) 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".*

11.2.27 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 (Defra, 2017); and
- published results of Local Authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies (RCBC, 2019).

11.2.28 A detailed description of how the baseline air quality has been derived for the proposed development is provided in Appendix 11.2 and is summarised in the Baseline Environment section of this chapter.

Consultation

11.2.29 In March 2020, the Environmental Health Department at RCBC was consulted to discuss and agree the scope and methodology of the air quality assessment. The points raised during this consultation and how they have been addressed is presented in Table 11.7 below:

Table 11.7: Consultation Responses Relevant to Air Quality

Date	Consultee and Issues Raised	How/ Where Addressed
March 2020 (P-re-application discussion)	**Redcar and Cleveland Borough Council** *Scientific Officer*	
	• the potential requirement for an ecological air quality assessment;	• An assessment of the air quality impacts at sensitive habitats has been undertaken and the results are provided in Appendix 11.5.
	• emissions from traffic during construction and operational phases of development;	• Access to the Application Site during construction and operation would be on roads associated with the wider industrial complex; there are few sensitive receptors located along these routes. Therefore, an assessment of the air emissions associated with construction and operational traffic has been scoped out
	• potential requirement to assess odour impacts;	• Combustion air for the energy recovery facility would be drawn from within the waste bunker hall creating a slight negative pressure ensuring that airflow and therefore odours, would be directed into rather than out of the building. Furthermore, the height of the stack and the destruction of odours during the incineration process would ensure that odours from the stack are unlikely to be detectable at ground level. As such, a risk assessment of odours has been scoped out.
	• details of the equipment to be used within the planning application.	• An overview of the equipment that would be used in the REC is set out in Chapter 2: Project Description.

Date	Consultee and Issues Raised	How/ Where Addressed
		Flue gas recirculation (FGR) may or may not be employed to reduce emissions. The assessment has conservatively assumed that the proposed development excludes FGR. Emissions from the stack have been assessed at a relatively low exit temperature. The stack exit temperature would be no lower than the temperature used in the assessment. As the gases leaving the stack will therefore have relatively low buoyancy, this is another conservative assumption as higher temperatures, and therefore buoyancy would increase dispersion of the plume.
May 2020 (Scoping response)	**Redcar and Cleveland Borough Council** ***Statutory Nuisance*** No objections to the scoping proposal were raised	Noted

Assessment Criteria and Assignment of Significance

11.2.30 Air quality technical guidance provides a specific method for describing the significance of effect for dust.

11.2.31 For other emissions, professional judgement by a competent, suitably qualified professional is required to establish the significance of effect arising as a consequence of the predicted impacts. This judgement has taken into account the extent of the population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process. In assigning significance levels to the likely effects, the following terms have been used.

- Substantial: only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process.
- Major: these beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision making process.
- Moderate: these beneficial or adverse effects may be important, but are not likely to be key decision making factors.
- Minor: these beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision making process, but are important in enhancing the subsequent design of the project.
- Negligible: no effects or those that pose a very small risk in comparison to normal risks in everyday life, or are beneath levels of perception, or are within normal bounds of variation or within the margin of forecasting error.

11.2.32 Effects assessed as moderate or above are considered within this assessment to be significant in terms of the Environmental Impact Assessment (EIA) Regulations.

11.2.33 For the stack emissions, the significance criteria are described in paragraphs 11.2.76 to 11.2.80.

Construction Phase

11.2.34 Exhaust emissions from construction-related vehicles (contractors' vehicles and Heavy Goods Vehicles (HGVs), diggers, and other diesel-powered vehicles) are unlikely to have a significant impact on local air quality except for large, long-term construction sites: the EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document (EPUK & IAQM, 2017) indicates that air quality assessments should include developments increasing annual average daily Heavy Duty Vehicle (HDV) traffic flows by more than 25 within or adjacent to an AQMA and more than 100 elsewhere. For Light Duty Vehicles (LDVs) the threshold is 100 within or adjacent to an AQMA and more than 500 elsewhere.

11.2.35 The impact of vehicle emissions from construction-related traffic has been scoped out of the assessment due to the relatively low number of vehicles expected to be generated and the relatively few numbers of sensitive receptors along the route.

11.2.36 Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter (British Standard Institute, 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; while others react chemically.

11.2.37 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.

11.2.38 The IAQM Guidance on the assessment of dust from demolition and construction (IAQM, 2014) sets out 350 metres as the distance from the site boundary and 50 metres for sensitive ecological receptors, within which there could potentially be nuisance dust and PM_{10} effects on human and ecological receptors, respectively.

11.2.39 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.

11.2.40 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: "*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.*"

11.2.41 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.*"

11.2.42 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.

11.2.43 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.

11.2.44 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.

11.2.45 The detail of the dust assessment methodology is provided in Appendix 11.3.

11.2.46 The assessment methodology does not consider the air quality impacts of dust from any contaminated land or buildings; potential impacts of ground contamination are assessed in Chapter 9: Geology, Hydrogeology and Contamination.

Operational Phase

11.2.47 The following operational effects have been assessed in this chapter.

- Residual emissions to air from the flue gas treatment system exhaust stack ('stack emissions') and their effects on human health and ecological receptors.
- Fugitive emissions of dust during the operational phase.

11.2.48 The assessment methodology for the stack emissions is described in the following sections.

Dispersion Model Selection

11.2.49 A number of commercially available dispersion models are able to predict ground level pollutant concentrations arising from emissions to atmosphere from elevated point sources such as an exhaust stack. 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 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 (CERC, 2016).

Meteorological Data

11.2.50 The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability:

- Wind direction determines the sector of the compass into which the plume of stack exhaust gas is dispersed;

- Wind speed affects the distance that the plume travels over time and can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise; and
- Atmospheric stability is a measure of the turbulence of the air, and particularly of its vertical motion. It therefore, affects the spread of the plume as it travels away from the source. New generation dispersion models, including ADMS, use a parameter known as the Monin-Obukhov length that, together with the wind speed, describes the stability of the atmosphere

11.2.51 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.

11.2.52 The year of meteorological data that is used for a modelling assessment can have a significant influence on source contribution concentrations. Dispersion model simulations have been performed using five years of data from Durham Tees Valley monitoring station between 2015 and 2019 as agreed during consultation with the Council.

11.2.53 Wind roses have been produced for each of the years of meteorological data used in this assessment and are presented in Figure 10.1.

Surface Roughness

11.2.54 The roughness of the terrain over which a plume passes can have a significant influence 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.

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

Terrain

11.2.56 A terrain file has been included within the model to ensure that the relative height between receptors and the source of emissions is taken into account.

Building Wake Effects

11.2.57 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. Chapter 2 (Project Description) provides a site layout plan of the proposed development. The buildings comprising the REC that have been included within the model are provided in Table 11.8. The predictions presented in this report therefore include building wake effects.

Table 11.8: Buildings Included Within the Model

Building Name	Approx. location of centre (x,y)	Length (m)	Width (m)	Height (m)
Boiler Hall	455863, 525961	25	63	49
Tipping Hall	455838, 525901	34	58	24
Bunker 1	455851, 525933	37	77	38
Bunker 2	455872, 525980	15	47	38
Turbine Hall	455925, 525997	49	24	25

Stack Parameters and Emissions Rates Used in Model

11.2.58 Stack and emissions characteristics modelled are provided in Table 11.9 and Table 11.10. For the purposes of modelling, it has been assumed that pollutant emission concentrations are at the limit set in the IED. Also provided are the BAT associated emissions limits (BAT-AELs) as set out in the BAT documents for waste incineration, as these have also been modelled across a grid and the results are provided in Appendix 11.7. For the pollutants not in the IED, NH_3, PAHs and PCBs emission concentrations are based on the limits in Table 11.2. As this is the maximum concentration that could be permitted, this is a worst-case assumption. The locations of the stacks are shown in Figure 10.2.

Table 11.9: Stack Characteristics (per stack)

Parameter	Unit	Value
Grid coordinates	x,y	455890, 526032
		455895, 526030
Stack height	m	80
Internal diameter	m	2.3
Efflux velocity	$m.s^{-1}$	19.06
Efflux temperature	°C	140
Actual Volumetric flow	$m^3.s^{-1}$	79.1
O_2	%	8.1
Water	%	17.8
Normalised Volumetric Flow (0°C, dry, 11% O_2)	$Nm^3.s^{-1}$	55.4

Table 11.10: Emissions Characteristics (per stack)

Pollutants	Mass Emission Rate ($g.s^{-1}$)		
	Short-term (IED)	Long-term (IED)	Long-term (BAT)
Particles (a)	1.663	0.554	6.651
HCl	3.325	0.554	0.333
HF	0.222	0.055	0.055
SO_2	11.085	2.771	1.663
NO_x	22.170	11.085	6.651
CO	5.542	2.771	2.771
Group 1 Metals Total (b)	-	2.77E-03	0.001
Group 2 Metals (c)	-	2.77E-03	0.001
Group 3 Metals Total (d)	-	2.77E-02	0.017
Dioxins and Furans	-	5.54E-09	2.22E-09
PCBs	-	2.77E-04	3.33E-09
PAHs – B[a]P	-	1.66E-04	1.66E-04
Ammonia	-	0.554	0.554

(a) All particles have been assumed to be PM_{10} and $PM_{2.5}$

(b) Cadmium (Cd) and thallium (Tl).

(c) Mercury (Hg).

(d) Antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni), and vanadium (V).

11.2.59 For hexavalent chromium (CrVI), the measured concentrations in the EA 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. The predicted Process Contribution (PC) at these concentrations have also been assessed in Section 11.6.

Stack Height Determination

11.2.60 There is a need to discharge the flue gases through two elevated stacks to allow dispersion and dilution of the residual combustion emissions. The stacks need to be of sufficient height to ensure that pollutant concentrations are acceptable by the time they reach ground level. The stacks also need to be high enough to ensure that releases are not within the aerodynamic influence of nearby buildings to avoid wake effects bringing the undiluted plume down to the ground.

11.2.61 A stack height determination has been undertaken to identify the stack height required to overcome the wake effects of nearby buildings and 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 its detailed guidance, Horizontal Guidance Note EPR H1 (Environment Agency, 2010) for undertaking risk assessments on 1 February 2016; however, the approach used here by RPS is consistent with that Environment Agency guidance which required the identification of "*an option that gives acceptable environmental performance but balances costs and benefits of implementing it."*

11.2.62 The stack height determination involved running a series of atmospheric dispersion modelling simulations to predict the ground-level concentrations with the stacks at different heights. The results of the stack height determination for the proposed development are provided in Appendix 11.4.

NO_x to NO_2 Assumptions for Annual-Mean Calculations

11.2.63 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 NOx remains in the form of NO. Total conversion is, therefore, an unrealistic assumption, particularly closer to the stack (Environment Agency, 2007). While this approach is useful for screening assessments, it is not appropriate for detailed assessments.

11.2.64 Historically, the Environment Agency has recommended that for a 'worse case scenario', a 70% conversion of NO to NO_2 should be considered for the 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%.

11.2.65 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 historical recommendations.

NOx to NO_2 Assumptions for Hourly-Mean Calculations

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

Modelling of Long-term and Short-term Emissions

11.2.67 Long-term (annual-mean) NO_2 has been modelled for comparison with the relevant annual mean objectives.

11.2.68 For short-term NO_2, the objective is for the hourly-mean concentration not to 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.

Decommissioning Phase

11.2.69 The risk of dust impacts during the decommissioning phase, including demolition, would be the same or similar to the risk of impacts during the construction phase and therefore, has not been assessed separately.

11.2.70 The impact of vehicle emissions from decommissioning-related traffic has been scoped out of the assessment due to the relatively low number of vehicles expected to be generated and the relatively few numbers of sensitive receptors along the route.

Sensitive Receptors

11.2.71 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. For human-health effects, 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, 2016b) provides examples of exposure locations and these are summarised in Table 11.11.

Table 11.11: Examples 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.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building's façades), or any other location where public exposure is expected to be short-term.
Daily-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's façade), or any other location where public exposure is expected to be short-term.
Hourly-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	Kerbside sites where the public would not be expected to have regular access.

Averaging Period	Objectives should apply at	Objectives should generally not apply at
	fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations to which the public might reasonably be expected to spend one hour or longer.	

11.2.72 The ground level concentrations have been modelled across a grid of 6 km by 6 km, with a spacing of 60 metres, centred on the midpoint of the two stacks.

11.2.73 In addition, the effects of the proposed development have been assessed at the façades of a representative selection of discrete local existing receptors. All 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 11.12 and illustrated in Figure 11.2.

Table 11.12: Modelled Sensitive Receptors

Receptor ID	Receptor	Receptor Type	Grid Reference	
			X	y
R1	Tesco DC	Industrial	455521	524198
R2	Intertek	Commercial	454076	524732
R3	Hartlepool Power Station	Industrial	452988	526955
R4	Frutarom UK	Commercial	453507	527302
R5	Birkbrow Moter	Commercial	457837	523976
R6	Broadway West	Residential	458050	523878
R7	York Road	Residential	458903	525055
R8	Northumbrian Water	Industrial	456751	524385
R9	Redcar Bulk Terminal	Commercial	454849	525945
R10	Paddy's Hole	Commercial	455616	527344
R11	Broadway East	Residential	458776	524150
R12	Tod Point Road	Residential	457942	525050

11.2.74 The receptor points selected for the assessment of sensitive ecological sites has been described in Appendix 11.5.

Significance of Effects

Construction Phase

11.2.75 Dust impact risk categories have been determined for demolition, earthworks, construction and trackout. These have been used to define the appropriate site-specific mitigation measures based on those described in the IAQM dust guidance (IAQM, 2014). The guidance states that provided the mitigation measures are successfully implemented, the resultant effects of the dust exposure will normally be "not significant".

Completed Development

11.2.76 The on-line Environment Agency guidance for risk assessments (Defra and Environment Agency, 2016) 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."

11.2.77 PC is the process contribution, i.e. the pollution from the proposed development. The PEC refers to the Predicted Environmental Concentration calculated as the PC added to the ambient (background) concentration. The on-line Environment Agency guidance (Defra and Environment Agency, 2016) continues by stating that:

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

11.2.78 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 EA)*
- *the PEC is already exceeding an environmental standard*".

11.2.79 On that basis:

- the impacts are not considered significant if the short-term PC is less than 10 % of the short-term EAL;
- the impacts are not considered significant if the long-term PC is less than 1 % of the long-term EAL; or
- the impacts are not considered significant if the PEC is below the EAL.

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

Limitations of the Assessment

11.2.81 All air quality assessment tools, whether models or monitoring measurements, have limitations. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).

11.2.82 The atmospheric dispersion model itself has limitations, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.

11.2.83 Each of the data inputs for the model, listed earlier, will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the range informed by an analysis of relevant, available data.

11.2.84 The main components of uncertainty in the total predicted concentrations, made up of the background concentration and the modelled fraction, include those summarised in Table 11.13.

Table 11.13: Summary of Main Components of Uncertainty

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background Concentration	Characterisation of current baseline air quality conditions.	The background concentration used within the assessment is the most conservative value from a comparison of measured and Defra mapped concentration estimates.	The background concentration is the major proportion of the total predicted concentration.
	Characterisation of future baseline air quality (i.e. the air quality conditions in the future assuming that the development does not proceed).	The future background concentration used in the assessment is the same as the current background concentration and no reduction has been assumed. This is a conservative assumption as, in reality, background concentrations are likely to reduce over time as cleaner vehicle technologies form an increasing proportion of the fleet.	The conservative assumptions adopted ensure that the background concentration used within the model should lead to a forecast concentration that is towards the top of the uncertainty range, rather than a central estimate.
Model Input/ Output Data	Meteorological data.	Uncertainties arise from any differences between the conditions at the met station and the development site, and between the historical met years and the future years. These have been minimised by using meteorological data collected at a representative measuring site. The model has been run for five full years of meteorological conditions and the highest results from any year reported	The modelled fraction is likely to contribute to the result being between a central estimate and the top of the uncertainty range.
	Receptors.	The model has been run for a grid of receptors and the maximum concentration reported / used to determine the stack height. In addition, receptor locations have been identified where concentrations are highest or where the greatest changes are expected.	

11.2.85 The analysis of the component uncertainties indicates that, notwithstanding the limitations of the assessment, the predicted total concentration is likely to be towards the top of the uncertainty range (i.e. towards worst-case) rather than being a central estimate. The actual concentrations when the proposed development is completed are unlikely to be higher than those presented within this report and are more likely to be lower.

11.3 Baseline Environment

11.3.1 A detailed description of how the baseline air quality has been derived for the proposed development is provided in Appendix 11.2. The background concentrations used in the assessment are set out in Table 11.14.

Table 11.14: Summary of Assumed Background Concentrations

Pollutant	Long-term	Short-term	Data Source
Nitrogen dioxide (NO_2)	28.5 µg.m^{-3}	56.9 µg.m^{-3} (a)	Average monitored at R27 (2015 – 2019)
Carbon monoxide (CO)	236.9 µg.m^{-3}	236.9 µg.m^{-3} (a)	Average monitored at Leeds Centre (2015 – 2019)
Particulates (PM_{10})	13.6 µg.m^{-3}	-	Average monitored at Redcar Dormanstown (2015 – 2019)
Particulates ($PM_{2.5}$)	7.0 µg.m^{-3}	-	Defra mapped (2017)
Sulphur dioxide (SO_2)	2.7 µg.m^{-3}	5.4 µg.m^{-3} (a)	Average monitored at Middlesbrough (2015 – 2019)
Hydrogen chloride (HCl)	0.24 µg.m^{-3}	-	UK Eutrophying and Acidifying Network
Hydrogen fluoride (HF)	2.5 µg.m^{-3} (b)	2.5 µg.m^{-3}	EPAQS 2006
Arsenic (As)	0.8 ng.m^{-3}	-	Monitored (Lead and Multi-elements Network Maximum Values)
Cadmium (Cd)	0.4 ng.m^{-3}	-	
Chromium (Cr)	3.2 ng.m^{-3}	-	
Copper (Cu)	6.1 ng.m^{-3}	-	
Lead (Pb)	16.8 ng.m^{-3}	-	
Manganese (Mn)	21.9 ng.m^{-3}	-	
Mercury (Hg)	2.3 ng.m^{-3}	-	
Nickel (Ni)	1.2 ng.m^{-3}	-	
Vanadium (V)	1.6 ng.m^{-3}	-	
Cobalt (Co)	0.1 ng.m^{-3}	-	
Antimony (Sb)	-	-	No local monitoring data available
Thallium (Tl)	-	-	
PAHs	0.21 ng.m^{-3}	-	Monitored (PAH Network)
PCBs	27.7 pg.m^{-3}	-	Monitored (Total Organic Micro-pollutants)
Dioxins and Furans	2.4 pg.m^{-3}	-	

Notes: (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

11.3.2 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 concentrations presented in the table above has been applied for future years.

11.3.3 As set out in paragraph 11.2.72, modelling has been undertaken for a 6 km by 6 km grid of receptors, centred on the midpoint of the REC’s two stacks. The hypothetical locations of all future receptors within the air quality study area have therefore been considered within the assessment.

11.4 Mitigation Measures Adopted as Part of the Project

Construction Mitigation

11.4.1 As part of the project design process, a number of designed-in measures have been committed to by the Applicant to reduce the potential for air quality impacts. The measures are considered standard industry practice for this type of development.

11.4.2 The IAQM dust guidance lists mitigation measures for low, medium and high dust risks.

11.4.3 As summarised in Table 10.18, the predicted dust impact risk is classified as low for demolition and trackout, and medium for earthworks and construction. The general site measures based on those described in the IAQM dust guidance as 'highly recommended' for medium risks are listed in Table 11.15. The 'highly recommended' measures for low risk demolition, and medium risk construction sites are also listed. There are no 'highly recommended' measures for low risk trackout or medium risk earthworks.

Table 11.15: Designed-in Dust Control Measures Adopted as part of the Project Design

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.
- 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 deposition, dust flux, real-time PM_{10} continuous and/or visual inspections.

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.
- 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

- 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.
- 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. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction (IAQM, 2012).

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.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extended period.
- 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.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- 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.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations

- 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.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- 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.

Waste management

- Bonfires and burning of waste materials will not be permitted.

Low risk measures specific to demolition

- 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.
- Bag and remove any biological debris or damp down such material before demolition

Medium risk measures specific to construction

- 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.

Operational Mitigation

Dust

11.4.4 The accepted best practice approach for the primary control of dust releases is containment within the building, which is the technique to be employed for the MRF and energy recovery facility. Air from within the energy recovery centre tipping hall would be drawn for use as combustion air which would maintain the building under slight negative pressure, so minimising the potential for fugitive dust releases. The dust levels inside the MRF and energy recovery facility would be managed so as to comply with health and safety obligations for personal exposure. For the Incinerator Bottom Area (IBA) area, containment is by a combination of transfer of material within the Application Site using conveyors, processing within a building, minimal disturbance of stockpiles, water suppression and boundary walls as described in Chapter 2: Project Description.

11.5 Assessment of Construction Effects

Construction Dust Impacts

11.5.1 The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces and smothering of vegetation which can reduce photosynthesis, respiration and transpiration. However, the implementation of proper control measures would ensure that dust deposition does not give rise to significant adverse effects. The following assessment, using the IAQM methodology (IAQM, 2014), 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".

Source

11.5.2 The volume of the existing buildings on site that would be demolished has been estimated to be less than 20,000 m^3 so the dust emission magnitude for the demolition phase is classified, using the IAQM dust guidance, as small.

11.5.3 The Application Site area is more than 10,000 m^2 so the dust emission magnitude for the earthworks phase is classified as large.

11.5.4 The total volume of the buildings to be constructed would be between 25,000 and 100,000 m^3 so the dust emission magnitude for the construction phase is classified as medium.

11.5.5 The maximum number of deliveries to the site in any one day is expected to be more than 50 HDVs. The dust emission magnitude for trackout is classified as large but would be contained within the site complex.

11.5.6 The source magnitudes in each of the four phases are summarised in Table 11.16.

Table 11.16: Dust Emission Magnitude for Demolition, Earthworks, Construction and Trackout

Demolition	Earthworks	Construction	Trackout
Small	Large	Medium	Large

Pathway and Receptor

11.5.7 All earthworks and construction activities would occur within the planning application boundary. As such, receptors at distances within 20 metres, 50 metres, 100 metres, 200 metres and 350 metres of the Application Site boundary have been identified and are illustrated in Figure 10.3. The sensitivity of the area has been classified and the results are provided in Table 11.17below.

Table 11.17: Sensitivity of the Surrounding Area for Demolition, Earthworks and Construction

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Low	>1 low sensitivity receptor located within 350 metres of the Application Site boundary (Appendix 11.3, Table 11.3.5).
Human Health	Low	≥1 low sensitivity receptor located within 350 m of the site boundary and background PM_{10} concentrations below 24 µg.m^{-3} (Appendix 11.3, Table 11.3.6).

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Ecology	Medium	Teesmouth and Cleveland Coast Site of Special Scientific Interest within 20 m of site boundary. >1 medium sensitivity receptor within 20 m of the site boundary (Appendix 11.3, Table 11.3.7).

11.5.8 The dust emission magnitude for trackout is classified as large. Trackout may occur on roads up to 500 metres from the Application Site and therefore does not reach the public highway. The main route to be used by site traffic is via the existing site access. The sensitivity of the area has been classified and the results are provided in Table 11.18 below.

Table 11.18: Sensitivity of the Surrounding Area for Trackout

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	Low	Redcar bulk terminal place of work located to the west. ≥1 medium sensitivity receptors located within 50 m of the roads (Appendix 11.3, Table 11.3.5).
Human Health	Low	Redcar bulk terminal place of work located to the west. ≥1 medium sensitivity receptors located within 50 m of the roads and PM_{10} concentration below 24 $\mu g.m^{-3}$ (Appendix 11.3, Table 11.3.6).
Ecology	-	No ecological sites within 50 m of the roads (Appendix 11.3, Table 11.3.7).

Overall Dust Risk

11.5.9 The dust emission magnitude has been considered in the context of the sensitivity of the area (Appendix 11.3, Tables 11.3.8 to 11.3.10) to give the dust impact risk. Table 11.19 summarises the dust impact risk for demolition, earthworks, construction and trackout prior to the implementation of mitigation.

Table 11.19: Dust Impact Risk for Demolition, Earthworks, Construction and Trackout – without Mitigation

Source	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Negligible	Low	Low	Low
Human Health	Negligible	Low	Low	Low
Ecology	Low	Medium	Medium	-
Risk	Low	Medium	Medium	Low

11.5.10 Taking the site as a whole, the overall risk is assessed as medium. The mitigation measures appropriate to a level of risk for the site as a whole and for each of the phases were set out in Table 11.15.

11.5.11 With the implementation of those committed mitigation measures, which are adopted as part of the proposed development, the residual construction dust effects will 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 (IAQM, 2014)recommends that significance is only assigned to the effect after the activities are considered with mitigation in place. The agreed mitigation measures would be included in a Code of Construction Practice (CoCP) that would be prepared post consent

Further Mitigation

11.5.12 Table 11.20 includes 'desirable' measures provided in the IAQM document some of which are not relevant to this application, and others which may be required by Redcar and Cleveland Borough Council:

Table 11.20: Desirable Dust Mitigation Measures as set out by the IAQM

Monitoring
• Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces within 100 metres of the Application Site boundary with cleaning to be provided if necessary.
Operating vehicle/machinery and sustainable travel
• Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate). • Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
Measures specific to demolition
• Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
Measures specific to trackout
• Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, 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. • Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
Measures specific to construction
• Avoid scabbling (roughening of concrete surfaces) if possible. • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. • For smaller supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust.

Future Monitoring

11.5.13 The recommended inspection / monitoring methods are:

- carry out regular site inspections, record inspection results and make an inspection log available to the local authority when asked; and
- 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.

Accidents and/or Disasters

11.5.14 In accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (the 'EIA Regulations'), consideration has been given to the expected significant adverse effects of the proposed development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters. 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 due to accidents or disasters are anticipated.

11.6 Assessment of Operational Effects

Stack Emissions

11.6.1 The maximum predicted concentration across the grid of modelled receptor points from any of the five years of meteorological data (2015 – 2019) has been derived and is reported below. Figures 10.4 and 10.5 illustrate the long and short-term NO_2 contours for the maximum PC across the grid.

Scenario 1: Short-Term Emission Limit Values

11.6.2 Table 11.21 summarises the maximum predicted PC to ground-level concentrations for all relevant pollutants with short-term emission limit values set out in the IED.

Table 11.21: Predicted Maximum Process Contribution at Short-Term IED Emission Limit Values

Pollutant	Averaging Period	EAL (µg.m-3)	Max PC (µg.m^{-3})	Max PC as % of EAL	Criteria (%)	Is PC Potentially Significant?
HCl	1 hour (maximum)	750	30.2	4	10	No
HF	1 hour (maximum)	160	2.0	1	10	No
SO_2	15 minute (99.90th percentile)	266	53.8	20	10	Yes
	1 hour (99.73th percentile)	350	49.0	14	10	Yes
	24 hour (99.18th percentile)	125	28.8	23	10	Yes
NO_2	1 hour (99.79th percentile)	200	34.9	17	10	Yes
PM_{10}	24 hour (90.41st percentile)	50	2.2	4	10	No
CO	8 hour (maximum daily running)	10000	23.1	0	10	No

11.6.3 The results presented in Table 11.21show that the predicted PC is below 10% of the relevant EAL for all pollutants except for SO_2 and NO_2.The impacts at short-term emission limits are potentially significant.

11.6.4 When the 15-minute mean SO_2 is added to the future ambient concentration (AC) of 5.4 µg.m^{-3}, the PEC is 59.2 µg.m^{-3}. As this is below the relevant EAL of 266 µg.m^{-3}, the effects are not considered to be significant.

11.6.5 When the 1-hour mean SO_2 is added to the future ambient concentration (AC) of 5.4 µg.m^{-3}, the PEC is 54.4 µg.m^{-3}. As this is below the relevant EAL of 350 µg.m^{-3}, the effects are not considered to be significant.

11.6.6 When the 24-hour mean SO_2 is added to the future AC of 5.4 µg.m^{-3}, the PEC is 34.3 µg.m^{-3}. As this is below the relevant EAL of 125 µg.m^{-3}, the effects are not considered to be significant.

11.6.7 When the 1-hour mean NO_2 is added to the future ambient concentration (AC) of 56.9 µg.m^{-3}, the PEC is 91.8 µg.m^{-3}. As this is below the relevant EAL of 200 µg.m^{-3}, the effects are not considered to be significant.

Scenario 2: Long-Term Emission Limit Values

11.6.8 Table 11.22 summarises the PC for all pollutants assuming that the project is operating at long-term IED emission limit values. The maximum predicted concentration across the grid have also been modelled assuming the project is operating at the long-term emission limit values as set out in the BAT Conclusions for waste incineration and are detailed in Appendix 11.7.

Table 11.22: Predicted Maximum Process Contribution at Long-Term IED Emission Limit Values

Pollutant	Averaging Period	EAL (µg.m^{-3})	Max PC (µg.m^{-3})	Max PC as % of EAL	Criteria (%)	Is PC Potentially Significant?
PM_{10}	24 hour (90.41st percentile)	50	0.7	1	10	No
	24 hour (annual mean)	40	0.21	1	1	No
$PM_{2.5}$	24 hour (annual mean)	25	0.21	1	1	No
HCl	1 hour (maximum)	750	5.0	1	10	No
HF	1 hour (maximum)	160	0.5	0	10	No
SO_2	15 minute (99.90th percentile)	266	13.4	5	10	No
	1 hour (99.73th percentile)	350	12.2	3	10	No
	24 hour (99.18th percentile)	125	7.2	6	10	No
	1 hour (annual mean)	50	1.1	2	1	Yes
NO_2	1 hour (99.79th percentile)	200	17.4	9	10	No
	1 hour (annual mean)	40	3.0	8	1	Yes
CO	8 hour (maximum daily running)	10,000	11.6	0	10	No
Cd	1 hour (annual mean)	0.005	0.0011	21	10	Yes
Tl	1 hour (maximum)	30	0.0251	0	10	No
	1 hour (annual mean)	1	0.0011	0	1	No
Hg	1 hour (maximum)	7.5	0.0251	0	10	No
	1 hour (annual mean)	0.25	0.0011	0	1	No
Sb	1 hour (maximum)	150	0.2514	0	10	No
	1 hour (annual mean)	5	0.0107	0	1	No
As	1 hour (annual mean)	0.003	0.0107	357	1	Yes
Cr	1 hour (maximum)	150	0.2514	0	10	No
	1 hour (annual mean)	5	0.0107	0	1	No
Co	1 hour (maximum)	6	0.2514	4	10	No
	1 hour (annual mean)	0.2	0.0107	5	1	Yes
Cu	1 hour (maximum)	200	0.2514	0	10	No
	1 hour (annual mean)	10	0.0107	0	1	No
Pb	1 hour (annual mean)	0.25	0.0107	4	1	Yes
Mn	1 hour (maximum)	1500	0.2514	0	10	No
	1 hour (annual mean)	0.15	0.0107	7	1	Yes

Pollutant	Averaging Period	EAL ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of EAL	Criteria (%)	Is PC Potentially Significant?
Ni	1 hour (annual mean)	0.02	0.0107	54	1	Yes
V	1 hour (maximum)	5	0.2514	5	10	No
	1 hour (annual mean)	1	0.0107	1	1	No
Dioxins & Furans	1 hour (annual mean)	-	2.14E-09		1	-
PAHs	1 hour (annual mean)	0.00025	6.43E-05	26	1	Yes
PCB	1 hour (annual mean)	0.2	1.07E-04	0	1	No
NH_3	1 hour (annual mean)	5	2.14E-01	4	10	No

11.6.9 The results presented in Table 11.22 show that the predicted PC is below 10% of the relevant short-term EAL and below 1% of the long-term EAL for all pollutants, except for annual-mean SO_2, NO_2, Cd (cadmium), As (arsenic), Co (cobalt), Pb (lead), Mn (manganese), Ni (nickel) and PAHs.

11.6.10 Table 11.23 summarises the Project PECs for all pollutants that were considered to be potentially significant in Table 11.21.

Table 11.23: Predicted Environmental Concentrations at Long-Term Emission Limit Values

Pollutant	Averaging Period	EAL ($\mu g.m^{-3}$)	AC ($\mu g.m^{-3}$)	Max PEC ($\mu g.m^{-3}$)	Max PEC as % of EAL	Is PEC Potentially Significant?
SO_2	1 hour (annual mean)	50	2.7	3.8	8	No
NO_2	1 hour (annual mean)	40	28.5	31.5	79	No
Cd	1 hour (annual mean)	0.005	0.00035	0.00142	28	No
As	1 hour (annual mean)	0.003	0.00084	0.01156	385	Yes
Co	1 hour (annual mean)	0.2	0.00013	0.01085	5	No
Pb	1 hour (annual mean)	0.25	0.01677	0.02748	11	No
Mn	1 hour (annual mean)	0.15	0.02185	0.03257	22	No
Ni	1 hour (annual mean)	0.02	0.00116	0.01187	59	No
PAHs	1 hour (annual mean)	0.00025	0.00021	0.00028	110	Yes

11.6.11 The results presented in Table 11.23 show that the PEC is below the EAL for SO_2, NO_2, Cd, Co, Pb, Mn and Ni and the impacts are therefore not considered significant.

11.6.12 For As, the PEC is above the EAL, however these predictions are based on the assumption that arsenic comprises the total of the group 3 metals emissions. In reality, the IED emission limit applies to all nine of the group 3 metals. The Environment Agency '*Releases from waste incinerators – Guidance on assessing group 3 metal stack emissions from incinerators'* version 4 (undated), provides a summary of 34 measured values for each metal recorded at 18 municipal waste and waste wood co-incinerators between 2007 and 2015. For As, the measured concentration varies from 0.04% to 5% of the IED emission concentration limit.

11.6.13 Table 11.24 shows the predicted PC if As is 5.0% of the emission limit. i.e. the PC for As has been divided by 20 (5% of the IED emission concentration limit).

Table 11.24: Predicted Environmental Concentrations at Long-Term Emission Limit Values

Pollutant	Averaging Period	EAL (μg.m-3)	AC (μg.m-3)	Max PC (μg.m-3)	Is PC Potentially Significant?	Max PEC (μg.m-3)	Max PEC as % of EAL	Is PEC Potentially Significant?
As	1 hour (annual mean)	0.003	0.00084	0.000536	Yes	0.00138	46	No

11.6.14 In this case, the predicted PC remains more than 1% above the EAL; however, the PEC for As is below the EAL. At long-term emission limits, the As impacts are therefore not considered significant.

11.6.15 For PAHs, the PEC is 100% of the EAL, therefore the long-term PAH impact based on modelling across the grid would be considered to be potentially significant if public exposure was possible. In this case, however, the maximum impact is predicted to occur immediately north of the Application Site (see Figure 10.4), where people would not be present for long periods. Table 11.6.2 in Appendix 11.6 shows that, at the nearest sensitive receptors, the maximum predicted PC is less than 1% of the EAL and the long-term PAH impacts are considered to be insignificant.

11.6.16 For hexavalent chromium (CrVI), 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 11.25 shows the predicted PC at these proportions.

Table 11.25: Predicted Environmental Concentrations at Long-Term Emission Limit Values

Pollutant	Averaging Period	EAL (μg.m-3)	Max PC (μg.m-3)	Max PC as % of EAL	Percentage of the IED Emission Limit
CrVI	1 hour (annual mean)	0.0002	5.36E-08	0	0.0005% (min)
			3.21-06	2	0.03% (max)

11.6.17 The PC at the upper end of the range is above 1% of the EAL. Table 11.6.2 in Appendix 11.6 shows that, at the nearest sensitive receptors, the maximum predicted PC for CrVI is less than 1% of the EAL and the long-term CrVI impacts are considered to be insignificant.

Dust Emissions

11.6.18 The operation of the REC could potentially cause dust emissions. The key activities likely to generate dust during the operation of the REC are delivery of waste, handling of waste on site, handling of combustion residues and transport of those residues off-site.

11.6.19 The Application Site is surrounded by heavily industrialised land and the nearest residential receptors are over 2 km away. On that basis, there are no sensitive human receptors in close proximity to the Application Site and the risk of dust impacts from the site is considered to be very low.

11.6.20 The Teeside and Cleveland Coast SSSI is located directly north of the Application Site and has the potential to be affected by dust emissions. The northern part of the Application Site would include the IBA recycling facility, which has the potential to generate dust. Several measures to ensure that fugitive dust emissions are kept to a minimum have been incorporated into the design. Most of the processing would be within buildings which would contain the dust. Once processed, the Incinerator Bottom Ash Aggregate (IBAA) would be stored for pH stabilisation in stockpiles. The stockpiles of processed IBAA would be open to the elements and rainwater runoff would be re-used on site for damping down of the stockpiles. Based on the above, the magnitude of the source of dust emissions is considered to be small.

11.6.21 On that basis, the overall risk of dust impacts from the process is considered to be very low. No significant effects are anticipated.

Further Mitigation

11.6.22 The effects are not considered to be significant and further mitigation is not required.

Future Monitoring

11.6.23 The proposed development would be regulated by the Environment Agency under the environmental permit and monitoring would be undertaken as a requirement of the permit.

Accidents/Disasters

11.6.24 In accordance with the EIA Regulations, consideration has been given to the expected significant adverse effects of the proposed development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters. 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

11.6.25 43,800 hours of meteorological data have been used within the model ensuring that a wide range of weather conditions have already been taken into account. Based on current knowledge, the results of the assessment are not expected to be affected by climate change.

11.7 Assessment of Cumulative Effects

11.7.1 The assessment of cumulative effects considers the impacts associated with the REC together with other developments and plans. The developments and plans selected as relevant to the cumulative assessment presented within this chapter are based upon the cumulative screening exercise described in Chapter 4:Environmental Assessment Methodology and Appendix 4.2 Details of the projects considered in the cumulative assessment in this chapter are provided in Table 11.26 below.

Table 11.26: Cumulative Developments Considered in the Assessment of Cumulative Effects on Air Quality

Cumulative development	Distance from the site	Potential effects
York Potash Port and Materials Handling Facilities R/2015/0218/DCO R/2015/0218/DCO R/2014/0626/FFM, R/2014/0627/FFM DCO made 20/07/16	681 metres	Development is within 700 metres of the Application Site, therefore there is potential for cumulative construction dust effects.

Cumulative development	Distance from the site	Potential effects
Grangetown Prairie Energy Recovery Facility R/2019/0767/OOM Application submitted 19 December 2019	4.34 km	Potential for cumulative stack emissions effects.
Graythorp Energy Centre H/2019/0275 Decision pending	4.36 km	Potential for cumulative stack emissions effects.

Construction Dust Impacts

11.7.2 During the construction phase, cumulative dust effects are only likely to occur where two or more 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 developments were to take place simultaneously. Effective implementation of relevant mitigation measures at both developments should ensure the risk of cumulative dust effects is minimal. York Potash Port and Materials Handling Facilities is the only development located within 700 metres of the proposed development, however there are no receptors within 350 metres of both developments. As a result, no significant cumulative effects are anticipated during the construction phase.

Stack Emissions

11.7.3 During the operational phase, cumulative effects are likely to occur where they include significant combustion processes.

11.7.4 Table 11.22 shows the pollutants for which impacts have been screened out as having an insignificant effect at human-health receptors based on the PC alone. For SO_2, cadmium, arsenic, lead, cobalt, manganese and nickel the impacts could not be screened out based on the PC alone but the PEC is less than half of the EAL. It is highly unlikely that, in combination with other developments, the PECs would exceed the EAL therefore the cumulative impacts for metals are considered to be not significant. For NO_2 the PEC is 79% of the EAL. For the cumulative effects to be significant, the PCs in combination with other development would need to be more than 8.5 $\mu g.m^{-3}$ at the point of maximum impact across the grid for the cumulative NO_2 PEC to exceed the EAL. This is considered to be highly unlikely, and the cumulative impacts for NO_2 are considered to be not significant.

11.7.5 For PAHs, Table 11.23shows that the maximum non-cumulative PEC across the modelled grid is 100% of the EAL immediately north of the REC site. The Grangetown Prairie ERF and Graythorp Energy Centre are located approximately 4.3 km south west of proposed development and are the only developments identified that could have a cumulative effect with regards to PAHs. The annual mean PAH impact of the Graythorp Energy Centre is less than 0.5% of the AQAL, therefore the magnitude of change is described as “insignificant”. No detailed air quality assessment has been submitted for Grangetown Prairie ERF.

Cumulative Effects on Receptor 1 and Receptor 3

11.7.6 Whilst the maximum non-cumulative PEC is 100% of the EAL across the modelled grid, when considering the PEC as discrete receptors, the PEC is lower.

11.7.7 At receptor 1, the closest modelled receptor to the Grangetown Prairie ERF, the PEC is 2.2×10^{-4} $\mu g.m^{-3}$ which is 88% of the EAL of 2.5×10^{-4} $\mu g.m^{-3}$. Therefore, the Grangetown Prairie ERF PC would need to be greater than 0.3 × 10^{-4} µg.m^{-3} for the cumulative PEC to exceed the EAL. This is more than three times greater than the proposed development PC of 8.60 × 10^{-6} µg.m^{-3} for receptor 1. This is considered highly unlikely considering that the Grangetown Prairie ERF is approximately 2.3 km from receptor 1.

11.7.8 At receptor 3, the closest modelled receptor to the Graythorp Energy Centre, the PEC is 2.1 × 10^{-4} µg.m^{-3} which is 85% of the EAL of 2.5 × 10^{-4} µg.m^{-3}. Therefore, the Graythorp Energy Centre PC would need to be greater than 0.4 × 10^{-4} µg.m^{-3} for the cumulative PEC to exceed the EAL. This is more than thirty times greater than the proposed development PC of 1.22 × 10^{-6} µg.m^{-3} for receptor 3. This is considered highly unlikely considering that the Graythorp Energy Centre is approximately 1.1 km from receptor 3. On this basis, the cumulative effect of PAHs is not considered to be significant.

11.8 Inter-relationships

11.8.1 The impact of stack emissions at designated habitat sites is considered in Appendix 11.5.

11.9 Summary of Effects

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

11.9.2 The results of the risk assessment of construction dust impacts undertaken using the IAQM dust guidance (IAQM, 2014), 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”.

11.9.3 Stack emissions from the proposed development 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 would 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.

11.9.4 The main dust mitigation measure is containment. Taking into account the fact that the processes would be largely contained, and the distance to sensitive receptors, the risk of dust impacts during operation is predicted to be not significant based on professional judgement.

11.9.5 Overall the air quality effects of the proposed development, both separately and cumulatively, are not considered to be significant.

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Table 11.27: Summary of Likely Environmental Effects on Air Quality

Receptor	Sensitivity of receptor	Description of impact	Mitigation measure	Magnitude of impact	Significance of effect	Significant / Not significant
Construction Phase						
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	Negligible	Not significant
Operational phase						
Grid of receptors 6 km by 6 km with 60 m spacing	Assumed to be high	Increased atmospheric pollutant concentrations	Long-term	Small	Negligible	Not significant
Representative receptors	Medium	Dust	Long-term	Small	Negligible	Not significant