Air Quality Assessment

Energy from Waste Facility

Shelton Road, Corby

For Encyclis Limited

www.rpsgroup.com

Quality Management

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Executive Summary

This report details the air quality assessment undertaken to accompany the permit application for the proposed energy from waste (EfW) facility at Shelton Road, Corby.

The assessment has been undertaken based upon appropriate information on the Proposed Development provided by Encyclis Limited (Encyclis) and its project team. In undertaking this assessment, RPS experts have exercised professional skills and judgement to the best of their abilities and have given professional opinions that are objective, reliable and backed with scientific rigour. These professional responsibilities are in accordance with the code of professional conduct set by the Institution of Environmental Sciences for members of the Institute of Air Quality Management (IAQM).

Regarding the operational phase, the most important consideration is stack emissions. This assessment predicts that ground-level concentrations will be within acceptable levels across the modelled grid and at sensitive receptors and will not give rise to any significant adverse effects.

The proposed development does not, in air quality terms, conflict with national or local policies. There are no constraints to the development in the context of air quality.

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1 Introduction

1.1 This report details the air quality assessment undertaken to accompany the permit application for the proposed energy from waste facility at Shelton Road, Corby.

1.2 The Application Site is located within the administrative area of North Northamptonshire Council (NNC) which has not designated any Air Quality Management Area (AQMAs) and air quality in the area is generally quite good.

1.3 This report begins by setting out the policy and legislative context for the assessment. The methods and criteria used to assess potential air quality effects have then been described. The baseline air quality conditions have been established taking into account Defra estimates, local authority documents and the results of any local monitoring. The results of the assessment of air quality impacts have been presented. A conclusion has been drawn on the significance of the residual effects.

2 Policy and Legislative Context

Industrial Emission Directive Limits

2.1 The plant would be designed and operated in accordance with the requirements of the Industrial Emissions Directive (2010/75/EU) [1], known hereafter as the IED, which requires adherence to emission limits for a range of pollutants.

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 six and eight hours.

2.3 The emission limit values in the IED are provided in Table 2.1.

Table 2.1 Relevant Industrial Emission Directive Limit Values

Pollutant	Emission Limits ($mg.Nm^{-3}$)	Averaging Period
Particles	30	Half-hourly
Hydrogen chloride (HCl)	60	Half-hourly
Hydrogen fluoride (HF)	4	Half-hourly
Sulphur dioxide (SO_2)	200	Half-hourly
Nitrogen oxides (NO_x)	400	Half-hourly
Carbon monoxide (CO)	100	Half-hourly
Group 1 metals (a)	0.05	30 minutes to 8 hours
Group 2 metals (b)	0.05	30 minutes to 8 hours
Group 3 metals (c)	0.5	30 minutes to 8 hours

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).

BAT Conclusions – Emissions Levels

2.4 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 a range of emission levels associated with best available techniques (BAT-AELs) and the upper end of the ranges are provided in Table 2.2.

Table 2.2: BAT-Associated Emission Levels (BAT-AELs)

Pollutant	BAT-AELs (mg.Nm^3)
Particles	5
Total Volatile Organic Carbon (TVOC)	10
Hydrogen fluoride (HF)	1
Sulphur dioxide (SO_2)	30
Nitrogen oxides (NOx)	120
Group 1 metals (a)	0.02 (d)
Group 2 metals (b)	0.02 (d)
Group 3 metals (c)	0.3 (d)
Dioxins and furans	0.00000006 (e)
PCBs	0.00000008 (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).

Environmental Permitting Regulations

2.5 The IED [1] applies an integrated environmental approach to the regulation of certain industrial activities. The Environmental Permitting Regulations (EPR) 2016 [2] implement the Directive relating to installations in England and Wales. The Regulations define activities that require an Environmental Permit from the Environment Agency (EA).

2.6 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 BAT, required by the IED, 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.

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.

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 EA is legally obliged to go beyond BAT requirements where EU Air Quality Limit Values may be exceeded by an existing operator.

2.9 The Environment Agency's on-line guidance entitled '*Environmental management – guidance, Air emissions risk assessment for your environmental permit'* [3] provides guidelines for air dispersion modelling. The assessment of air quality effects for the proposed development is consistent with this guidance.

Air Quality Standards Regulations

2.10 The Air Quality Standards Regulations 2010 [4], amended by The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 [5], sets limit values for ambient air concentrations 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, certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). These limit values are legally binding on the Secretary of State. The Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.

2.11 The statutory air quality limit values are listed in Table 2.3.

Table 2.3 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	20 $\mu g.m^{-3}$	-
Carbon Monoxide (CO)	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

Pollutant	Averaging Period	Limit Values	Not to be Exceeded More Than
Lead (Pb)	Annual	0.25 µg.m^{-3}	-
Arsenic (As)	Annual	0.006 µg.m^{-3}	-
Cadmium (Cd)	Annual	0.005 µg.m^{-3}	-
Nickel (Ni)	Annual	0.02 µg.m^{-3}	-

Non-Statutory Air Quality Objectives and Guidelines

2.12 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 [6]. 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 Air Quality Standards Regulations.

2.13 Non-statutory air quality guidelines also exist within the Air Quality Standards Guidelines (EPAQS) [7]. The non-statutory objectives and guidelines are presented in Table 2.4.

Table 2.4 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}
Polycyclic aromatic hydrocarbons (PAHs).	Annual	0.00025 µg.m^{-3} B[a]P
Hydrogen Chloride	1 hour (a)	750 µg.m^{-3}
Hydrogen Fluoride	1 hour (a)	160 µg.m^{-3}

Notes: (a) EPAQS recommended guideline values

♦ Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels.

Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date.

Environmental Assessment Levels

2.14 The Environment Agency's on-line guidance entitled '*Environmental management – guidance, Air emissions risk assessment for your environmental permit'* [3] provides further assessment criteria in the form of EALs.

2.15 Table 2.5 presents all available EALs for the pollutants relevant to this assessment. There are no EALs for Total Volatile Organic Compounds (TVOCs). The EA's on-line guidance states *"If you release volatile organic compounds into the air and do not know what all the substances in them are, treat them all as 100% benzene in your risk assessment. If you want to treat them as something else, you'll need to explain why".* For other projects, the EA has requested that VOCs are compared with the 1,3-butadiene EAL rather than benzene. The 1,3-butadiene EAL is lower than the benzene EAL of 5 µg.m^{-3}. To ensure the assessment is conservative we have compared the TVOCs with 1,3-butadiene EAL.

Table 2.5 Environmental Assessment Levels (EALs)

Pollutant	Long-term EAL, µg.m^{-3}	Short-term EAL, µg.m^{-3}
Carbon monoxide (CO)	-	30,000 (1 hour mean) 10,000 (8-hour running mean)
Hydrogen chloride (HCl)	-	750
Hydrogen fluoride (HF)	16 (monthly average)	160
Antimony (Sb)	5	150
Cadmium (Cd)	0.005	-
Chromium (Cr)	5	150
Chromium VI ((oxidation state in the PM_{10} fraction)	0.00025	-
Cobalt (Co)	0.2 (a)	6 (a)
Copper (Cu)	10	200
Manganese (Mn)	0.15	1500
Mercury (Hg)	0.25	7.5
Thallium (Tl)	1 (a)	30 (a)
Vanadium (V)	-	1
PAHs	0.00025 B[a]P	-
PCBs	0.2	6
Ammonia (NH_3)	180	2500
1,3-butadiene	2.25	-

Note: (a) EALs have been obtained from the EA's earlier Horizontal Guidance Note EPR H1 guidance note as no levels are provided in the current guidance.

2.16 Within the assessment, the statutory air quality limit values (as presented in Table 2.3) 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.

3 Assessment Methodology

Approach

3.1 This air quality assessment includes the key elements listed below:

- Establishing the background Ambient Concentration (AC) from consideration of Air Quality Review & Assessment findings and assessment of existing local air quality through a review of available air quality monitoring and Defra background map data in the vicinity of the proposed site.
- Quantitative assessment of the operational effects on local air quality from stack emissions utilising a “new generation” Gaussian dispersion model, ADMS 5. Assessment of Process Contributions (PC) from the facility in isolation, and assessment of resultant Predicted Environmental Concentrations (PEC), taking into account cumulative impacts through incorporation of the AC.

3.2 Air quality guidance advises that the organisation engaged in assessing the overall risks should hold relevant qualifications and/or extensive experience in undertaking air quality assessments. The RPS air quality team members involved at various stages of this assessment have professional affiliations that include Fellow and Member of the Institute of Air Quality Management, and Chartered Environmentalist and have the required academic qualifications for these professional bodies. In addition, the Director responsible for authorising all deliverables has over 18 years’ experience.

Pollutant Concentrations

3.3 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.

3.4 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. Background pollution levels are described in detail in Section 4.

Dispersion Model Selection

3.5 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.

3.6 ADMS comprises a number of individual modules each representing one of the processes contributing to dispersion or an aspect of data input and output. Amongst the features of ADMS are:

- An up-to-date dispersion model in which the boundary layer structure is characterised by the height of the boundary layer and the Monin-Obukhov length, a length scale dependent on the friction velocity and the heat flux at the surface. This approach allows the vertical structure of the boundary layer, and hence concentrations, to be calculated more accurately than does the use of Pasquill-Gifford stability categories, which were used in many previous models (e.g. ISCST3). The restriction implied by the Pasquill-Gifford approach that the dispersion parameters are independent of height is avoided. In ADMS the concentration distribution is Gaussian in stable and neutral conditions, but the vertical distribution is non-Gaussian in convective conditions, to take account of the skewed structure of the vertical component of turbulence;
- A number of complex modules including the effects of plume rise, complex terrain, coastlines, concentration fluctuations and buildings; and
- A facility to calculate long-term averages of hourly mean concentration, dry and wet deposition fluxes and radioactivity, and percentiles of hourly mean concentrations, from either statistical meteorological data or hourly average data.

Model Inputs

Meteorological Data

3.7 The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability as described below:

- Wind direction determines the sector of the compass into which the plume 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.

3.8 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.

3.9 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 Wittering between 2017 and 2021.

3.10 Wind roses have been produced for each of the years of meteorological data used in this assessment and are presented in Figure 1.

Stack Parameters and Emissions Rates used in the Model

3.11 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.

3.12 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 [3], for undertaking risk assessments on 1 February 2016; however, the approach used here by RPS is consistent with that EA guidance which required the identification of "*an option that gives acceptable environmental performance but balances costs and benefits of implementing it.*"

3.13 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 60 metres and extending up in 5 metre increments, until a height of 80 metres was reached. The results of the stack height determination are provided in Appendix A. The stack height determination indicated a 75 m stack height was appropriate.

3.14 Stack emissions characteristics modelled are provided in Table 3.1. The stack location is shown in Figure 2.

Table 3.1 Stack Characteristics

Parameter	Unit	Value
Stack height	m	75
Internal diameter	m	2.5
Efflux velocity	$m.s^{-1}$	15.83
Efflux temperature	°C	130
Actual O_2 (Dry)	%	6.0
Actual H_2O	%	19.9
Actual volumetric flow	$m^3.s^{-1}$	77.69
Normalised volumetric flow (Dry, 0°C, 11% O_2)	$m^3.s^{-1}$	63.22

3.15 The emission concentrations used in the assessment have been drawn from the IED emission concentration limits and the BAT-AELs set out in Section 2. For pollutants with no IED limit, the BAT-AEL has been used.

3.16 For long-term averaging periods, the BAT-AELs have been used for all pollutants except NOx and dioxins and furans. For long-term NOx the EfW facility would meet an emission concentration of 100 mg/Nm^3 and for dioxins and furans it would meet 0.00000004 mg/Nm^3

3.17 Polycyclic aromatic hydrocarbons (PAHs) emissions are not specifically regulated under the IED or the BAT conclusions. Similarly, the EA specifies the EAL for PAHs in terms of a concentration of benzo-a-pyrene (B[a]P). On that basis, this assessment considers the emissions of benzo-a-pyrene (a subset of PAHs) and compares the predicted concentrations with the EAL for B[a]P.

3.18 Table 3.2 summarises the emission concentrations used in this assessment.

Table 3.2 Modelled Emission Concentrations

Pollutant	Emission Concentrations ($mg.Nm^{-3}$) for Short-term Impacts	Emission Concentrations ($mg.Nm^{-3}$) for Long-Term Impacts
Particles	30	5
TVOCs	-	10
HCl	60	-
HF	4	1
SO_2	200	30
NOx	400	100 (d)
CO	100	-
Group 1 metals (a)	0.05	0.02
Group 2 metals (b)	0.05	0.02
Group 3 metals (c)	0.5	0.3
Dioxins and furans	-	0.00000004 (d)
NH_3	10	
PCBs	0.00000008	
B[a]P	0.00005 (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) Facility will meet this lower emission concentration.
(e) Emission concentration for B[a]P taken from Figure 8.121 of the Best Available Techniques (BAT) Reference Document on Waste Incineration (2019). The maximum average measured emission concentration of 0.00015 $\mu g.m^{-3}$ was not used as this was an outlier. The second highest measured emission concentration of 0.00005 $\mu g.m^{-3}$ has been used.

Table 3.3 Mass Emissions of Released Pollutants

Pollutants	Mass Emission Rate (g.s^{-1})	
	Long-term	Short-term
Particles	0.316	1.897
TVOCs	0.63	-
HCl	-	3.793
HF	0.063	0.253
SO_2	-	12.643
NOx	6.322	25.287
CO	-	6.322
Group 1 metals Total (a)	1.26E-02	3.16E-03
Group 2 metals (b)	1.26E-03	3.16E-03
Group 3 metals Total (c)	1.90E-02	3.16E-02
Dioxins and furans	2.53E-07	-
NH_3	0.63	-
PCBs	5.06E-09	-
B[a]P	3.16E-06	-

Notes:
(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)

3.19 Emission limits in the IED and the BAT-AELs 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.

Terrain

3.20 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.

Surface Roughness

3.21 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.

3.22 A surface roughness length of 0.5 m, which the software developer recommends for use in parkland and open suburbia, has been used within the model to represent the average surface characteristics across the study area.

Building Wake Effects

3.23 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 dominant structures (i.e. with the greatest dimensions likely to promote turbulence) included within the model are listed in Table 3.4.

Table 3.4 Dimensions of Buildings Included Within the Dispersion Model

ID	Name	Approx Centre Location		Height (m)	Length (m)	Width (m)	Angle (Degrees)
		X (m)	Y (m)				
1	FGT Hall	490904	290856	39.50	43.20	33.00	67.88
2	Silos	490894	290873	21.50	19.60	6.00	67.88
3	Air Cooled Condenser	490918	290828	34.00	47.00	29.00	67.88
4	Boiler House	490946	290873	49.90	46.80	33.00	67.88
5	IBA Loading	490965	290902	10.00	21.00	6.00	67.88
6	Turbine Hall	490959	290848	23.00	42.00	24.00	67.88
7	Structure btwn BH/TH	490986	290885	44.38	36.20	42.00	67.88
8	Electrical Building	490996	290861	23.00	36.20	10.00	67.88
9	Control Room	490999	290866	26.80	26.10	3.80	67.88
10	Tipping Hall	491021	290899	18.50	39.00	42.00	67.88
11	Admin Building	491030	290875	16.00	39.00	10.00	67.88

Model Outputs

Receptors

3.24 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.TG22 [8] provides examples of exposure locations and these are summarised in Table 3.5.

Table 3.5: 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.	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 buildings 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 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 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.
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

3.25 The ground level concentrations have been modelled at locations across a grid of 3 km by 3 km, with a spacing of 30 m, centred on the stack.

3.26 In addition, the effects

3.27 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 m, representative of typical head height. The locations of these discrete receptors are listed in Table 3.6 and illustrated in Figure 2.

Table 3.6: Modelled Sensitive Receptors

ID	Description	National Grid Reference X(m)	National Grid Reference Y(m)
R1	Brookfield	490528	291829
R2	Weldon Lodge	491738	291528
R3	Priors Hall Development/ Corby Business Academy	492236	290908
R4	Barnwell Gardens	492336	290549
R5	4 Larratt Road	492117	289813
R6	143 Corby Road	491735	289534
R7	86 Weldon Road	490111	288904
R8	79 Turnwell Lane	489744	289108
R9	73 Pen Green Lane	489483	290118

Note: Receptors have been modelled at 1.5m above ground level, representative of typical head height

3.28 The AQS NO_2 objectives for all the different averaging periods apply at the façades of the modelled sensitive receptors.

NO_x to NO_2 Relationship

3.29 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.

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

NOx to NO_2 Assumptions

3.31 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. The Environment Agency advises [9] that:

"For combustion processes where no more than 10% of nitrogen oxides are emitted as nitrogen dioxide, you can assume worst case conversion ratios to nitrogen dioxide of:

- *35% for short-term average concentrations*

- *70% for long-term average concentrations"*

3.32 These ratios have been used in the assessment.

Modelling of Long-term and Short-term Emissions

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

3.34 For short-term NO_2, the objective is for the hourly-mean concentration not to exceed 200 µg.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 µg.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.

Monthly-Mean Calculations

3.35 ADMS does not allow an averaging period of a month to be modelled so a factor has been derived to convert the annual-mean to a monthly mean using the dispersion factors in the on-line EA guidance entitled '*Environmental management – guidance, Air emissions risk assessment for your environmental permit'* [3] shown in the table below.

Table 3.7 Dispersion Factors

Effective height of release in metres*	Monthly Dispersion Factor	Annual Dispersion Factor
0	529	148
10	33.7	32
20	6.2	4.6
30	2.3	1.7
50	0.68	0.52
70	0.31	0.24
100	0.13	0.11
150	0.052	0.048
200	0.026	0.023

*where the stack is less than 3 m above any surrounding buildings, the effective height of release is 0m.

3.36 Monthly and annual-mean dispersion factors for a stack height of 75 m have been derived using interpolation. The monthly dispersion factor of 0.28 is 1.28 times higher than the annual dispersion factor of 0.22. Therefore, the monthly mean has been derived by multiplying the annual mean by a conversion factor of 1.28.

Significance Criteria

3.37 The on-line EA guidance entitled '*Environmental management – guidance, Air emissions risk assessment for your environmental permit'* [3] has been used. This guidance 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."

3.38 It continues by stating that:

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

3.39 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 contributions – if you think this is the case contact the Environment Agency)*
- *The PEC is already exceeding an environmental standard"*

3.40 The EA online guidance '*Environmental permitting: air dispersion modelling reports'* [10] states:

"For a detailed modelling assessment PCs are insignificant where they are less than:

- *10% of a short-term environmental standard*
- *1% of a long-term environmental standard*

At the detailed modelling stage there are no criteria to determine whether:

- *PCs are significant*
- *PECs are insignificant or significant*

You must explain how you judged significance and base this on the site specific circumstances."

3.41 On that basis, the results of the detailed modelling presented in this report have been used as follows:

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

- The effects are not considered significant if the long-term PC is less than 1% of the long-term EAL or the PEC is below the EAL.

Uncertainty

3.42 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. 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).

3.43 The atmospheric dispersion model itself contributes some of this uncertainty, 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.

3.44 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.

3.45 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 3.8.

Table 3.8 Approaches to Dealing with Uncertainty used Within the Assessment

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background 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 background concentration is the major proportion of the total predicted concentration. The conservative assumptions adopted ensure that the background concentration used within the model contributes towards the results being 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	

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
		collated at a representative measuring site. The model has been run for 5 full years of meteorological conditions.	
	Receptors	The model has been run for a grid of receptors. In addition, receptor locations have been identified where concentrations are highest or where the greatest changes are expected.	

3.46 The analysis of the component uncertainties indicates that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.

4 Baseline Air Quality Conditions

Overview

4.1 The ambient concentration often represents a large proportion of the total pollution concentration, so it is important that the ambient concentration selected for the assessment is realistic. EPUK & IAQM guidance highlight public information from Defra and local monitoring studies as potential sources of information on air quality.

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

- Defra maps [11], which show estimated pollutant concentrations across the UK in 1 km grid squares;
- published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies; and
- results published by national monitoring networks.

4.3 A detailed description of how the baseline air quality has been derived for the proposed development is provided in Appendix B. The ambient concentrations used in the assessment are set out in Table 4.1.

Table 4.1 Summary of Assumed Ambient Concentrations

Pollutant	Long-term	Short-term (a)	Data Source
Nitrogen dioxide (NO_2)	18.4 µg.m^{-3}	36.8 µg.m^{-3}	10N (Corby Borough Council 2019)
Particulates (PM_{10})	14.1 µg.m^{-3}	28.2 µg.m^{-3}	Defra mapped
Carbon monoxide (CO)	402 µg.m^{-3}	804 µg.m^{-3}	5-year average (2015-2019) at London Marylebone Road
Sulphur dioxide (SO_2)	2.2 µg.m^{-3}	4.4 µg.m^{-3}	5-year average (2015-2019) at Nottingham Centre
Hydrogen chloride (HCl)	0.30 µg.m^{-3}	-	4-year average (2012-2015) at Caenby/Rothamsted
Arsenic (As)	0.0008 µg.m^{-3}	-	5-year average (2015-2019) of Fenny Compton
Cadmium (Cd)	0.0001 µg.m^{-3}	-	
Cobalt (Co)	0.0001 µg.m^{-3}	-	
Manganese (Mn)	0.0026 µg.m^{-3}	-	
Nickel (Ni)	0.0006 µg.m^{-3}	-	
Lead (Pb)	0.0052µg.m^{-3}	-	
Vanadium (V)	0.0006 µg.m^{-3}	-	
1,3-butadiene	0.10 µg.m^{-3}	-	Max of 5-year average (2017-2022) at Chilbolton
Mercury (Hg)	0.0189 µg.m^{-3}	-	Max of 5-year average (2013-2017) at Runcorn Weston Point
Antimony (Sb)	0.0009 µg.m^{-3}	-	Beacon Hill (2013)

Note:
(a) Short-term concentrations approximately equate to the 90th percentile, which is approximately equivalent to 2 x the annual mean.

5 Assessment of Air Quality Impacts

Stack Emissions

5.1 For each of the five years of meteorological data (2017 to 2021), the maximum predicted ground-level concentration across the modelled domain has been derived and are reported below. The maximum predicted ground-level concentrations at the selected sensitive receptors have also been predicted and these are summarised in Appendix C. The impacts at ecological receptors are assessed in Appendix D.

5.2 Table 5.1 summarises the maximum predicted PC across the modelled grid to ground-level concentrations. Where the PC cannot be screened out as insignificant, the resulting PECs have been calculated by adding the PC to the background AC.

5.3 For hexavalent chromium (CrVI), the measured concentrations in the Environment Agency '*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 5.1 shows the predicted PC at these proportions.

5.4 A contour plot of the 99.79th percentile of hourly-mean PCs is shown in Figure 4. A contour plot of the annual-mean PCs is shown in Figure 3. The contours are for the year with the maximum PC across the grid.

Table 5.1 Predicted Maximum Process Contributions (µg.m^{-3})

Pollutant	Averaging Period	EAL (µg.m^{-3})	Max PC (µg.m^{-3})	Max PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC (µg.m^{-3})	PEC (µg.m^{-3})	PEC as % of EAL	PEC is Potentially Significant?
PM_{10}	24 hour (90.41st percentile)	**50**	1.06	2	10	No	-	-	-	-
	24 hour (annual mean)	**40**	0.05	0	1	No	-	-	-	-
$PM_{2.5}$	24 hour (annual mean)	**20**	0.05	0	1	No	-	-	-	-
HCl	1 hour (maximum)	**750**	17.86	2	10	No	-	-	-	-
HF	1 hour (maximum)	**160**	1.19	1	10	No	-	-	-	-
	1 hour (monthly mean)	**16**	0.01	0	1	No	-	-	-	-
SO_2	15 minute (99.90th percentile)	**266**	32.11	12	10	Yes	4.4	36.47	14	No
	1 hour (99.73th percentile)	**350**	27.65	8	10	No	-	-	-	-
	24 hour (99.18th percentile)	**125**	17.20	14	10	Yes	4.4	21.56	17	4.4
NO_2	1 hour (99.79th percentile)	**200**	19.57	10	10	No	-	-	-	-
	1 hour (annual mean)	**40**	0.67	2	1	Yes	18.4	19.07	48	No
CO	8 hour (maximum daily running)	**10,000**	14.46	0	10	No	-	-	-	-
	1 hour (maximum)	**30,000**	29.77	0	10	No	-	-	-	-
Cd	1 hour (annual mean)	**0.005**	0.0002	4	1	Yes	0.0001	0.0003	6	No
Tl	1 hour (maximum)	**30**	0.015	0	10	No	-	-	-	-
	1 hour (annual mean)	**1**	0.0002	0	1	No	-	-	-	-

Pollutant	Averaging Period	EAL ($\mu g.m^{-3}$)	Max PC ($\mu g.m^{-3}$)	Max PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	PEC as % of EAL	PEC is Potentially Significant?
Hg	1 hour (maximum)	**7.5**	0.015	0	10	No	-	-	-	-
	1 hour (annual mean)	**0.25**	0.0002	0	1	No	-	-	-	-
Sb	1 hour (maximum)	**150**	0.149	0	10	No	-	-	-	-
	1 hour (annual mean)	**5**	0.003	0	1	No	-	-	-	-
As	1 hour (annual mean)	**0.006**	0.003	48	1	Yes	0.001	0.004	62	No
Cr	1 hour (maximum)	**150**	0.149	0	10	No	-	-	-	-
	1 hour (annual mean)	**5**	0.003	0	1	No	-	-	-	-
Co	1 hour (maximum)	**6**	0.149	2	10	No	-	-	-	-
	1 hour (annual mean)	**0.2**	0.003	1	1	No	-	-	-	-
Cu	1 hour (maximum)	**200**	0.149	0	10	No	-	-	-	-
	1 hour (annual mean)	**10**	0.003	0	1	No	-	-	-	-
Pb	1 hour (annual mean)	**0.25**	0.003	1	1	No	-	-	-	-
Mn	1 hour (maximum)	**1500**	0.149	0	10	No	-	-	-	-
	1 hour (annual mean)	**0.15**	0.003	2	1	Yes	0.003	0.005	4	No
Ni	1 hour (annual mean)	**0.02**	0.003	14	1	Yes	0.001	0.003	17	No
V	24 hour (maximum)	**1**	0.061	6	1	Yes	0.001	0.062	6	No
Dioxins & Furans	1 hour (annual mean)	-	3.86E-08	-	1	-	-	-	-	-

Pollutant	Averaging Period	EAL (µg.m^{-3})	Max PC (µg.m^{-3})	Max PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC (µg.m^{-3})	PEC (µg.m^{-3})	PEC as % of EAL	PEC is Potentially Significant?
B[a]P	1 hour (annual mean)	**0.00025**	4.82E-07	0	1	No	-	-	-	-
PCB	1 hour (annual mean)	**0.2**	7.71E-10	0	1	No	-	-	-	-
	1 hour (maximum)	**6**	2.38E-08	0	10	No	-	-	-	-
NH_3	1 hour (annual mean)	**180**	9.64E-02	0	1	No	-	-	-	-
	1 hour (maximum)	**2500**	2.98E+00	0	10	No	-	-	-	-
TVOCs	1 hour (annual mean)	**2.25**	9.64E-02	4	1	Yes	8.85E-02	1.85E-01	8	No
Cr VI	1 hour (annual mean)	**0.00025**	8.68E-07	0	1	No	-	-	-	-

5.5 The results presented in Table 5.1 show that the predicted PC is below 10% of the relevant short-term EAL and below 1% of the long-term EAL or the PEC is below 100% for all pollutants.

Significance of Effects

5.6 As set out in Section 3, it is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.

5.7 Based on the predicted concentrations, the effects are deemed to be not significant, with no predicted exceedances of any objectives or standards at the modelled discrete receptors.

6 Mitigation

6.1 Predicted concentrations of pollutants have been demonstrated by the assessment to meet all relevant air quality standards, objectives and EALs. On that basis, no mitigation is proposed.

7 Conclusions

7.1 This assessment has considered the air quality impacts during the operational phase of the proposed EfW facility at Shelton Road, Corby.

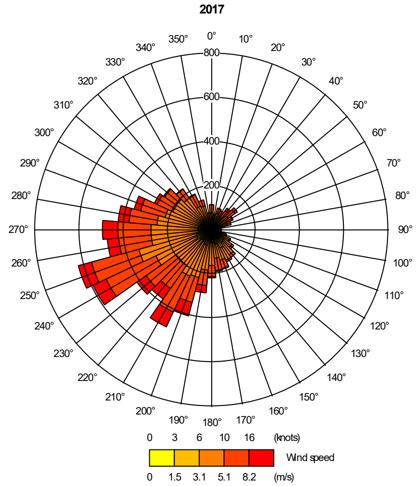
7.2 Emissions from the facility has been assessed through detailed dispersion modelling using best practice approaches. The assessment has been undertaken based on a number of conservative assumptions. This is likely to result in an over-estimate of the contributions that will arise in practice from the facility. The operational impact on receptors in the local area is predicted to be 'negligible' taking into account the changes in pollutant concentrations and the absolute levels. Using the criteria adopted for the assessment, together with professional judgement, the effects are not considered significant.

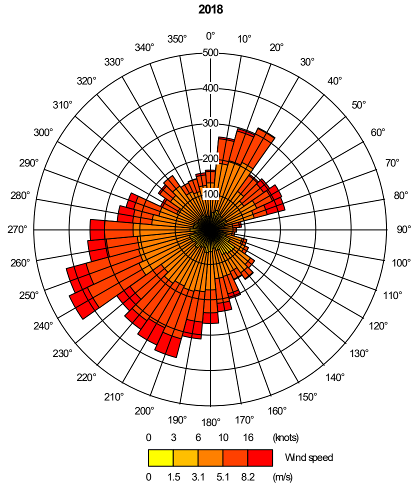
7.3 Overall, the effects of the facility are not considered to be significant.

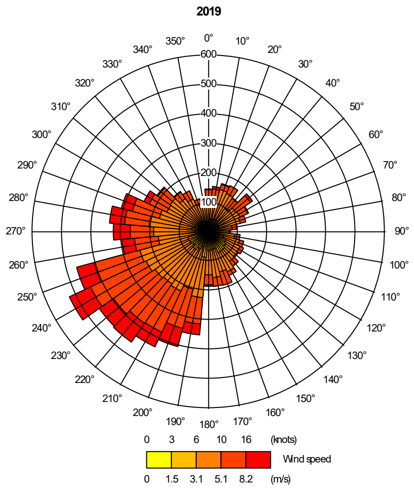
Glossary

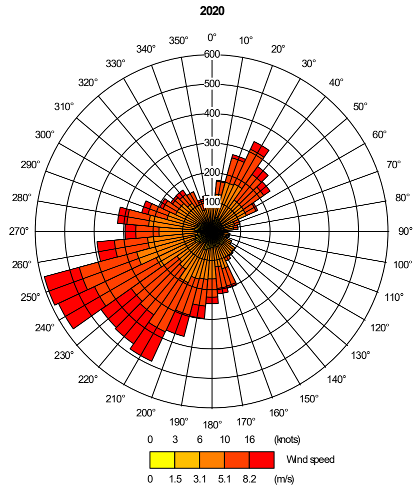
ADMS	Atmospheric Dispersion Modelling System
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
Effect	The consequences of an impact, experienced by a receptor
EPUK	Environmental Protection UK
IAQM	Institute of Air Quality Management
Impact	The change in atmospheric pollutant concentration and/or dust deposition. A scheme can have an 'impact' on atmospheric pollutant concentration but no effect, for instance if there are no receptors to experience the impact
R&A	Review and Assessment
Receptor	A person, their land or property and ecologically sensitive sites that may be affected by air quality
Risk	The likelihood of an adverse event occurring

Figures









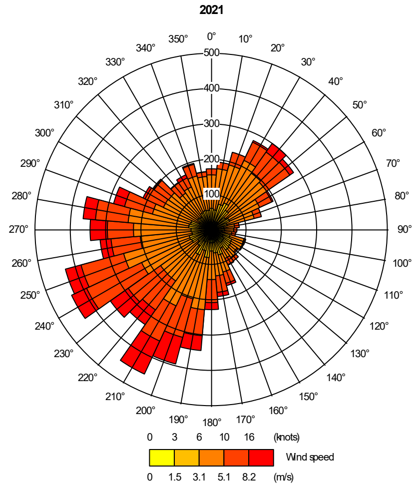


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Figure 1: Wind Roses – Wittering (2017 - 2021)

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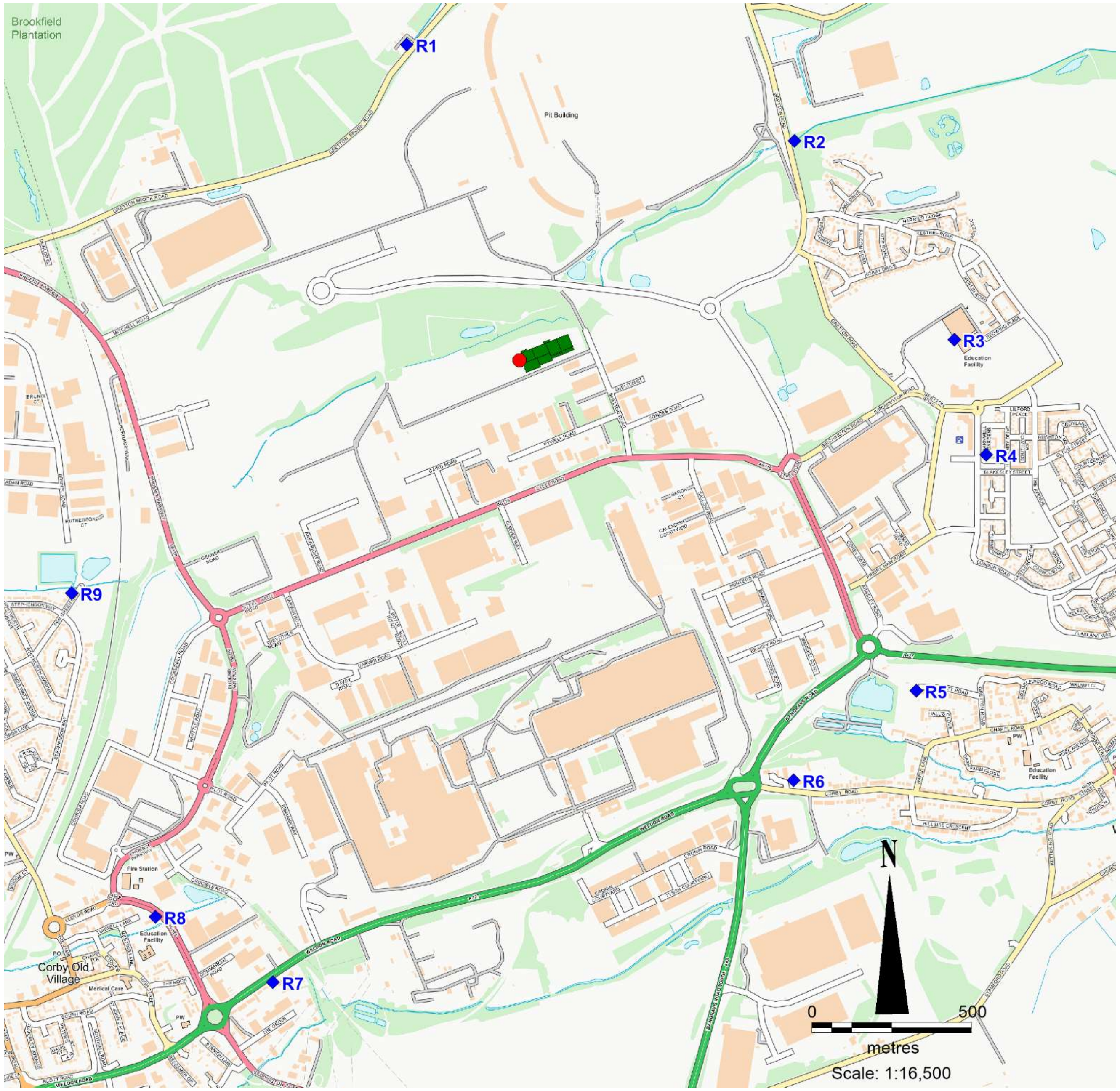

Legend

- Modelled Stack Location
- Modelled Buildings
- Modelled Human Health Receptors

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Figure 2: Stacks and Modelled Receptors

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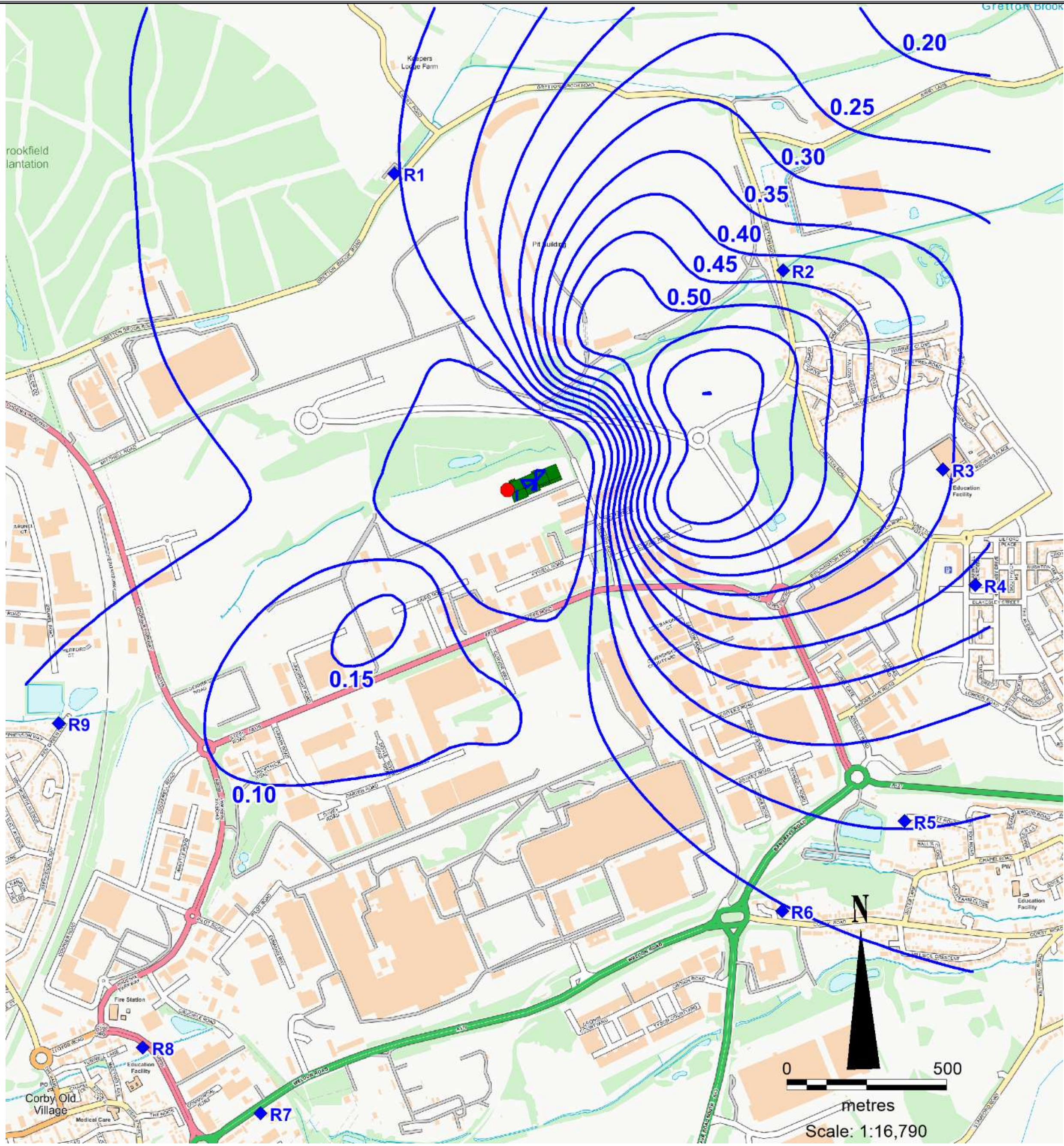

Legend

- Modelled Stack Location
- Modelled Buildings
- Modelled Human Health Receptors
- Contour

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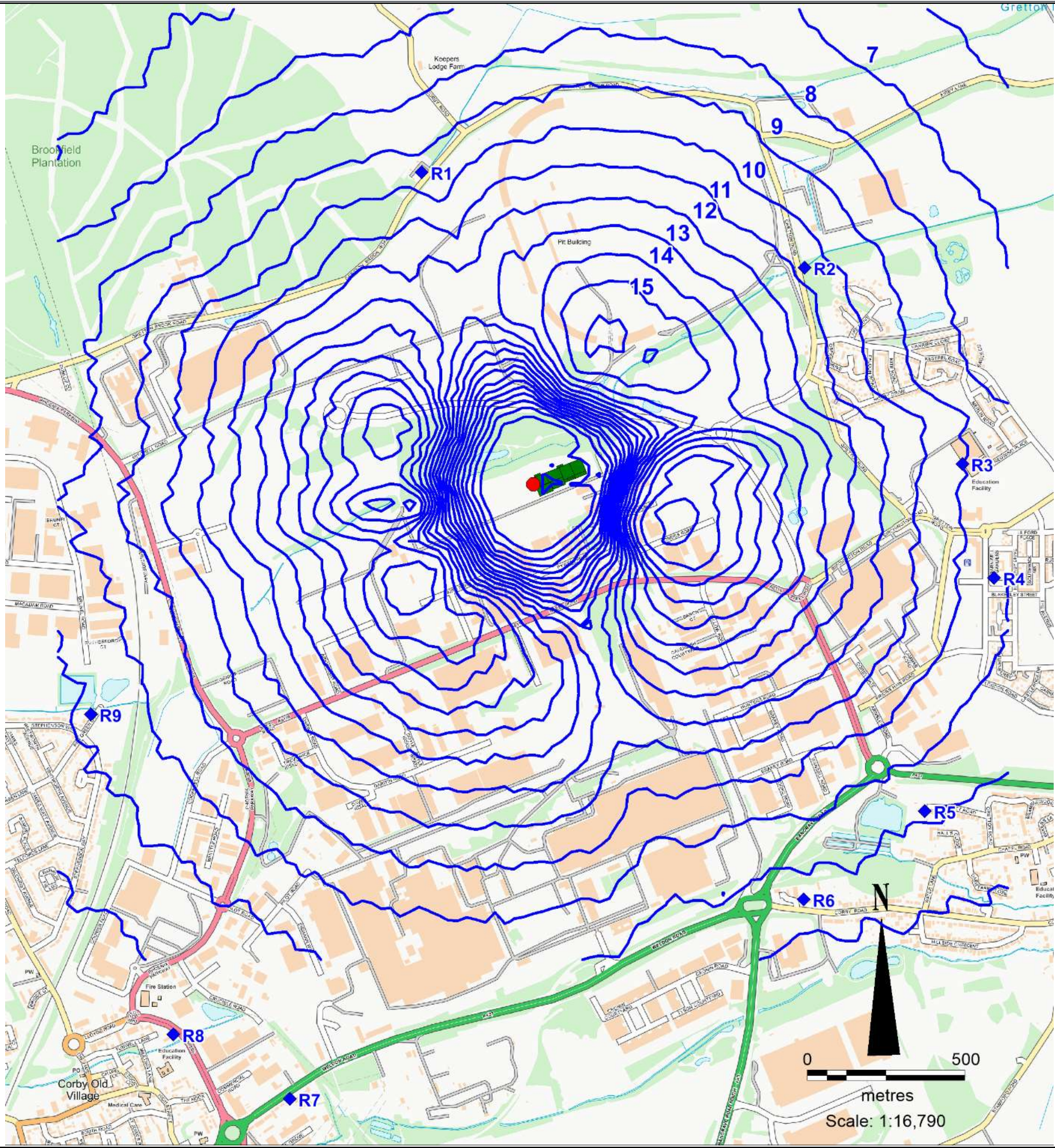
Figure 3: Annual-mean NO_2 PC ($\mu g.m^{-3}$)



Legend

- Modelled Stack Location
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Figure 4: 99.79th percentile of hourly-mean PC ($\mu g.m^{-3}$)

Appendices

Appendix A: Stack Height Determination

A.1 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 height of the stack. The Environment Agency removed their detailed guidance, Horizontal Guidance Note EPR H1 [12], for undertaking risk assessments on 1 February 2016; however, the approach used here is consistent with that EA guidance which required the identification of "*an option that gives acceptable environmental performance but balances costs and benefits of implementing it."*

Methodology

A.2 Model simulations have been run using ADMS 5 to determine what stack height is required to provide adequate dispersion/dilution and to overcome local building wake effects.

A.3 The stack height determination considers ground level concentrations over the averaging periods relevant to the air quality assessment, together with the full range of all likely meteorological conditions using five years (2017 to 2021) of hourly sequential meteorological data from Wittering. The model was run for a range of stack heights between 60 m and 80 m, in 5 m increments.

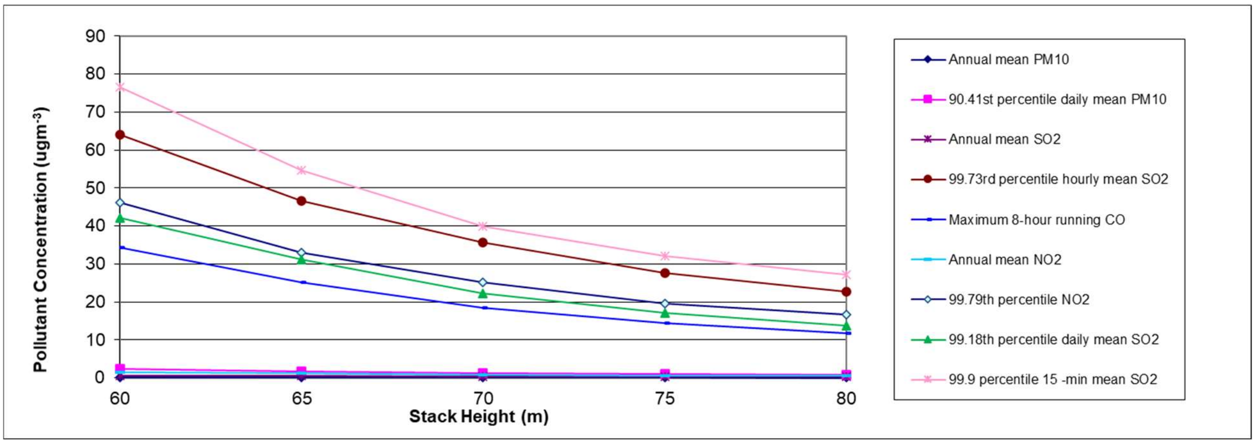
A.4 For the purposes of stack height determination, the modelled domain was 3 km by 3 km centred on the proposed development and with a grid spacing of 30 m. Results have been reported for the location where the highest concentration is predicted and for the worst-case meteorological conditions. Sensitive receptors have also been considered but concentrations were all below the highest concentration across the grid.

Stack Height Determination Results

A.5 The stack height modelling results have been analysed in two stages:

Stage 1 - The maximum predicted Process Contributions (PCs) have been plotted against height to determine if there is a height at which no benefit is gained from increases in stack heights.

Graph A: Maximum Predicted Process Contributions vs Stack Height



Stage 2 – The on-line EA 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."

A.6 It continues by stating that:

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

A.7 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 contributions – if you think this is the case contact the Environment Agency)*
- *The PEC is already exceeding an environmental standard"*

A.8 The EA online guidance 'Environmental permitting: air dispersion modelling reports' [13] states:

"For a detailed modelling assessment PCs are insignificant where they are less than:

- *10% of a short-term environmental standard*
- *1% of a long-term environmental standard*

At the detailed modelling stage there are no criteria to determine whether:

- *PCs are significant*
- *PECs are insignificant or significant*

You must explain how you judged significance and base this on the site specific circumstances."

A.9 On that basis, the stack height has been determined as the height at which:

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

A.10 Table A.1 provides the maximum predicted PC for a range of pollutants, covering a range of averaging periods, at each stack height modelled. Table A.2 provides the maximum predicted PC as a percentage of the EAL at each stack height modelled. Table A.3 provides the maximum predicted PEC as a percentage of the EAL at each stack height modelled.

Table A.1 Maximum Predicted Process Contributions (μg.m^{-3}) at each Stack Height Modelled

Stack Height	Annual-mean PM_{10}	90.41st percentile daily mean PM_{10}	Maximum hourly HCl	99.73rd percentile hourly mean SO_2	Maximum 8-hour running CO	Annual-mean NO_2	99.79th percentile NO_2	99.18th percentile daily mean SO_2	99.9th percentile 15-minute mean SO_2
60m	0.11	2.40	24.81	64.02	34.42	1.57	46.07	42.13	76.64
65m	0.08	1.71	22.15	46.62	25.14	1.15	33.02	31.21	54.70
70m	0.06	1.32	19.93	35.56	18.43	0.86	25.10	22.17	39.91
75m	0.05	1.06	17.86	27.65	14.46	0.67	19.57	17.20	32.11
80m	0.04	0.87	15.95	22.68	11.74	0.55	16.58	13.73	27.21

Table A.2 Maximum Predicted Process Contributions as a Percentage of the EAL at each Stack Height Modelled

Stack Height	Annual-mean PM_{10}	90.41st percentile daily mean PM_{10}	Maximum hourly HCl	99.73rd percentile hourly mean SO_2	Maximum 8-hour running CO	Annual-mean NO_2	99.79th percentile NO_2	99.18th percentile daily mean SO_2	99.9th percentile 15-minute mean SO_2
EAL	**40**	**50**	**750**	**350**	**10000**	**40**	**200**	**125**	**266**
60m	0.3	4.8	3.3	18.3	0.3	3.9	23.0	33.7	28.8
65m	0.2	3.4	3.0	13.3	0.3	2.9	16.5	25.0	20.6
70m	0.2	2.6	2.7	10.2	0.2	2.1	12.6	17.7	15.0
75m	0.1	2.1	2.4	7.9	0.1	1.7	9.8	13.8	12.1
80m	0.1	1.7	2.1	6.5	0.1	1.4	8.3	11.0	10.2

Cells are shaded grey where the predicted process contribution is above 1% of EAL for long-term average periods and 10% for short-term average periods.

Table A.3 Maximum Predicted Environmental Concentration as a Percentage of the EAL at each Stack Height Modelled

Stack Height	99.73rd percentile hourly mean SO_2	Annual-mean NO_2	99.79th percentile NO_2	99.18th percentile daily mean SO_2	99.9th percentile 15-minute mean SO_2
EAL	**350**	**40**	**200**	**125**	**266**
60m	19.5	49.9	41.4	37.2	30.4
65m	14.6	48.9	34.9	28.5	22.2
70m	11.4	48.1	31.0	21.2	16.6
75m	9.1	47.7	28.2	17.2	13.7
80m	7.7	47.4	26.7	14.5	11.9

Discussion

A.11 The results in Table A.2 indicate that there are no heights below 80 m at which the impacts can be screened-out as insignificant based on the PC alone. In particular, the maximum predicted PC for NO_2 and SO_2 is above 1% for long-term averaging periods and 10% for short-term averaging periods at the majority of heights modelled.

A.12 For PM_{10}, HCl and CO the PCs are below the 1% and 10% criteria at heights above 60 m.

A.13 The results in Table A.3 indicate that for all pollutants and averaging periods the PECs are all well below the EAL at all heights.

A.14 On that basis, and using the significance criteria adopted for this assessment, the impacts would be considered not significant at all heights modelled and the proposed stack height of 75 m is considered to be appropriate.

Conclusion

A.15 Based on the results of the detailed stack height modelling and using professional judgement, the impacts would be considered not significant at all heights modelled and the proposed stack height of 75 m is considered appropriate. The modelling undertaken in this report assumes a 75 m high stack.

Appendix B: Baseline

Nitrogen Dioxide

B.1 The Council monitors NO_2 at several roadside and urban background locations. The concentrations measured over recent years are provided in Table B.1.

Table B.1 Measured Annual-mean NO_2 Concentrations

Site Name	2015	2016	2017	2018	2019
8N	11.1	12.6	11.6	12.6	14.5
10N	-	-	-	-	18.4
9N	9.3	10.2	9.5	9.6	9.3

B.2 The 10N diffusion tube measurement of 18.4 $\mu g.m^{-3}$ from 2019 has been used in the assessment.

Sulphur Dioxide

B.3 The Automatic Urban and Rural Network (AURN) monitors ambient concentrations of SO_2. The nearest monitoring location for SO_2 (with the most complete data) is at Nottingham Centre AURN.

B.4 The concentrations monitored over recent years are provided in Table B.2.

Table B.2 Measured Annual-mean SO_2 Concentrations

Pollutant	2016	2017	2018	2019	2020	Average
SO_2 ($\mu g.m^{-3}$)	2.37	1.99	1.96	2.36	2.21	2.18

B.5 The average concentrations have been used within the assessment.

Heavy Metals

B.6 The Heavy Metals Network monitors the concentrations in air for a range of metallic elements at urban, industrial and rural sites.

B.7 The nearest monitored concentrations are measured at the Fenny Compton site. The five-year average concentrations are shown in Table B.3. Antimony (Sb) and Mercury (Hg) have been measured at the Beacon Hill and Runcorn Weston Point sites. Cromium (Cr) was measured at Runcorn West.

Table B.3 Measured Annual-mean Metal Concentrations (µg.m^{-3})

Pollutant	5-year average (2015-2019)
As	0.0008
Cd	0.0001
Cr	0.0015
Co	0.0001
Mn	0.0026
Ni	0.0006
Pb	0.0052
V	0.0006
Sb	0.0009
Hg	0.0189

1,3-Butadiene

B.8 1,3-Butadiene is measured at four locations in the UK. The concentrations monitored over recent years are provided in Table B.3.

Table B.4 Measured Annual-mean 1,3-Butadiene Concentrations (ug.m^{-3})

Site Name	2016	2017	2018	2019	2020	Average
Auchencorth Moss	0.01	0.01	0.01	0.02	0.03	0.02
Chilbolton Observatory	0.12	0.16	0.09	0.09	0.06	0.10
London Eltham	0.09	0.06	0.05	0.06	0.06	0.07
London Marylebone Road	0.07	0.10	-	0.05	-	0.07

B.9 The highest 5-year average concentration of 0.10 ug.m^{-3}, measured at Chilbolton Observatory, has been used within the assessment.

Hydrochloric Acid

B.10 Hydrochloric acid has not been measured since 2016. The concentrations monitored over the most recent years at the Caenby and Rothamsted monitoring locations are provided in Table B.3.

Table B.5 Measured Annual-mean HCl Concentrations (ug.m^{-3})

Site Name	2012	2013	2014	2015	Average
Caenby	0.27	0.46	0.32	0.16	0.30
Rothamsted	0.28	0.39	0.27	0.28	0.30

B.11 The average concentration of 0.30 ug.m^{-3} has been used within the assessment.

Hydrogen Fluoride

B.12 The Expert Panel on Air Quality Standards (EPAQS) was set up in 1991 to provide independent advice on air quality issues. In 2005 it published a draft report entitled 'Guidelines for halogen and hydrogen halides in ambient air for protecting human health against acute irritancy effects' [14]. The report noted that only a small number of measurements of ambient concentrations of hydrogen fluoride have been made in the UK. All of these have been made in the vicinity of three industrial plants. Many samples were below the limit of detection; however, measurable values were in the range 0.05 to 3.5 µg.m^{-3} as approximate monthly averages. The report concluded that it would be reasonable to expect maximum 1 hour mean hydrogen fluoride concentrations to reach about 2.46 µg.m^{-3} at rural sites exposed to coal-fired power station plumes.

B.13 The range of expected short-term background HF levels is well below the short-term EAL guideline of 250 µg.m^{-3}.

Appendix C: Impacts at Discrete Sensitive Receptors

Table C.4 Maximum Predicted Process Contributions (µg.m^{-3}) at each Modelled Receptor

Pollutant	Averaging Period	Receptor 1	2	3	4	5	6	7	8	9
PM_{10}	24 hour (90.41st percentile)	0.26	0.65	0.45	0.36	0.24	0.15	0.24	0.27	0.22
	24 hour (annual mean)	0.01	0.03	0.03	0.02	0.01	0.01	0.01	0.01	0.01
$PM_{2.5}$	24 hour (annual mean)	0.01	0.03	0.03	0.02	0.01	0.01	0.01	0.01	0.01
HCl	1 hour (maximum)	4.59	4.93	4.25	5.10	3.42	5.04	3.94	4.52	3.82
HF	1 hour (maximum)	0.31	0.33	0.28	0.34	0.23	0.34	0.26	0.30	0.25
	1 hour (monthly mean)	2.70E-03	8.35E-03	6.59E-03	5.23E-03	2.82E-03	1.78E-03	2.39E-03	2.49E-03	2.39E-03
SO_2	15 minute (99.90th percentile)	15.89	17.61	16.66	15.61	13.55	11.56	11.45	11.13	13.24
	1 hour (99.73th percentile)	13.08	15.08	13.08	12.03	10.73	9.44	8.20	8.27	10.38
	24 hour (99.18th percentile)	5.11	8.00	6.65	6.14	4.44	4.38	3.72	3.89	5.54
	1 hour (annual mean)	0.06	0.20	0.15	0.12	0.07	0.04	0.06	0.06	0.06

Pollutant	Averaging Period	Receptor 1	2	3	4	5	6	7	8	9
NO_2	1 hour (99.79th percentile)	9.43	10.67	9.31	8.53	7.62	6.68	5.78	5.83	7.49
	1 hour (annual mean)	0.15	0.46	0.36	0.29	0.15	0.10	0.13	0.14	0.13
CO	8 hour (maximum daily running)	6.87	7.47	6.59	5.06	4.93	4.09	3.54	4.00	4.78
	1 hour (maximum)	7.65	8.22	7.08	8.49	5.70	8.39	6.56	7.54	6.37
Cd	1 hour (annual mean)	4.21E-05	1.30E-04	1.03E-04	8.16E-05	4.39E-05	2.78E-05	3.72E-05	3.89E-05	3.72E-05
Tl	1 hour (maximum)	3.83E-03	4.11E-03	3.54E-03	4.25E-03	2.85E-03	4.20E-03	3.28E-03	3.77E-03	3.18E-03
	1 hour (annual mean)	4.21E-05	1.30E-04	1.03E-04	8.16E-05	4.39E-05	2.78E-05	3.72E-05	3.89E-05	3.72E-05
Hg	1 hour (maximum)	3.83E-03	4.11E-03	3.54E-03	4.25E-03	2.85E-03	4.20E-03	3.28E-03	3.77E-03	3.18E-03
	1 hour (annual mean)	4.21E-05	1.30E-04	1.03E-04	8.16E-05	4.39E-05	2.78E-05	3.72E-05	3.89E-05	3.72E-05
Sb	1 hour (maximum)	3.83E-02	4.11E-02	3.54E-02	4.25E-02	2.85E-02	4.20E-02	3.28E-02	3.77E-02	3.18E-02
	1 hour (annual mean)	6.31E-04	1.95E-03	1.54E-03	1.22E-03	6.59E-04	4.18E-04	5.58E-04	5.83E-04	5.58E-04
As	1 hour (annual mean)	6.31E-04	1.95E-03	1.54E-03	1.22E-03	6.59E-04	4.18E-04	5.58E-04	5.83E-04	5.58E-04
Cr	1 hour (maximum)	3.83E-02	4.11E-02	3.54E-02	4.25E-02	2.85E-02	4.20E-02	3.28E-02	3.77E-02	3.18E-02

Pollutant	Averaging Period	Receptor 1	2	3	4	5	6	7	8	9
	1 hour (annual mean)	6.31E-04	1.95E-03	1.54E-03	1.22E-03	6.59E-04	4.18E-04	5.58E-04	5.83E-04	5.58E-04
Co	1 hour (maximum)	3.83E-02	4.11E-02	3.54E-02	4.25E-02	2.85E-02	4.20E-02	3.28E-02	3.77E-02	3.18E-02
	1 hour (annual mean)	6.31E-04	1.95E-03	1.54E-03	1.22E-03	6.59E-04	4.18E-04	5.58E-04	5.83E-04	5.58E-04
Cu	1 hour (maximum)	3.83E-02	4.11E-02	3.54E-02	4.25E-02	2.85E-02	4.20E-02	3.28E-02	3.77E-02	3.18E-02
	1 hour (annual mean)	6.31E-04	1.95E-03	1.54E-03	1.22E-03	6.59E-04	4.18E-04	5.58E-04	5.83E-04	5.58E-04
Pb	1 hour (annual mean)	6.31E-04	1.95E-03	1.54E-03	1.22E-03	6.59E-04	4.18E-04	5.58E-04	5.83E-04	5.58E-04
Mn	1 hour (maximum)	3.83E-02	4.11E-02	3.54E-02	4.25E-02	2.85E-02	4.20E-02	3.28E-02	3.77E-02	3.18E-02
	1 hour (annual mean)	6.31E-04	1.95E-03	1.54E-03	1.22E-03	6.59E-04	4.18E-04	5.58E-04	5.83E-04	5.58E-04
Ni	1 hour (annual mean)	6.31E-04	1.95E-03	1.54E-03	1.22E-03	6.59E-04	4.18E-04	5.58E-04	5.83E-04	5.58E-04
V	24 hour (maximum)	2.08E-02	2.33E-02	1.99E-02	1.95E-02	1.29E-02	1.47E-02	1.10E-02	1.15E-02	1.88E-02
Dioxins & Furans	1 hour (annual mean)	8.41E-11	2.60E-10	2.05E-10	1.63E-10	8.78E-11	5.57E-11	7.44E-11	7.78E-11	7.44E-11
B[a]P equivalent	1 hour (annual mean)	1.05E-07	3.25E-07	2.57E-07	2.04E-07	1.10E-07	6.96E-08	9.31E-08	9.72E-08	9.31E-08
PCB	1 hour (annual mean)	1.68E-10	5.21E-10	4.11E-10	3.26E-10	1.76E-10	1.11E-10	1.49E-10	1.56E-10	1.49E-10

Pollutant	Averaging Period	Receptor								
		1	2	3	4	5	6	7	8	9
	1 hour (maximum)	6.12E-09	6.57E-09	5.66E-09	6.80E-09	4.56E-09	6.71E-09	5.25E-09	6.03E-09	5.09E-09
NH_3	1 hour (annual mean)	2.10E-02	6.51E-02	5.14E-02	4.08E-02	2.20E-02	1.39E-02	1.86E-02	1.94E-02	1.86E-02
	1 hour (maximum)	7.65E-01	8.22E-01	7.08E-01	8.49E-01	5.70E-01	8.39E-01	6.56E-01	7.54E-01	6.37E-01
TVOCs	1 hour (annual mean)	2.10E-02	6.51E-02	5.14E-02	4.08E-02	2.20E-02	1.39E-02	1.86E-02	1.94E-02	1.86E-02
CR VI	1 hour (annual mean)	1.89E-07	5.86E-07	4.62E-07	3.67E-07	1.98E-07	1.25E-07	1.67E-07	1.75E-07	1.68E-07

Appendix D: Impacts at Ecological Receptors

Scope

D.1 The EA guidance on 'Screening for protected conservations areas' (EA, 2020b) requires identification of:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites (protected wetlands) within 10 km of the proposed development; and
- Sites of Special Scientific Interest (SSSIs) and Local Nature sites (ancient woods, local wildlife sites (LWSs) and national and local nature reserves) within 2 km of the proposed development.

D.2 As such, the assessment considers the impact of the development at the following designated sites:

- Brookfield Plantation (LWS)
- Corby Old Quarry Gullet (LWS)
- Corby Old Quarry Pond Brookfield (LWS)
- Plantation Cutting (LWS)
- Corby Tunnel Quarries (LWS)

Critical Levels

D.3 Critical levels are maximum atmospheric concentrations of pollutants for the protection of vegetation and ecosystems and are specified within UK air quality regulations. Where relevant, background concentrations at each designated site have been derived from the UK Air Pollution Information System (APIS) database [15].

Critical Loads

D.4 Critical loads refer to the quantity of pollutant deposited, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

Critical Loads – Nutrient Nitrogen Deposition

D.5 Percentage contributions to nutrient nitrogen deposition have been derived from the results of the ADMS dispersion modelling. Deposition rates have been calculated using empirical methods recommended by the Environment Agency, as follows:

- The deposition flux ($\mu g.m^{-2}.s^{-1}$) has been calculated by multiplying the ground level NO_2 and NH_3 concentrations ($\mu g.m^{-3}$) by the deposition velocity. The EA guidance provides deposition velocities of 0.0015 $m.s^{-1}$ for short habitats and 0.003 $m.s^{-1}$ for forests for NO_2 and 0.02 $m.s^{-1}$ for short habitats and 0.03 $m.s^{-1}$ for forests for NH_3.
- Units of $\mu g.m^{-2}.s^{-1}$ have been converted to units of $kg.ha^{-1}.year^{-1}$ by multiplying the dry deposition flux by the standard conversion factor of 96 for NO_2 and 259.9 for NH_3.

- The total N deposition flux has then been calculated as the sum of the contribution from NO_2 and NH_3.

D.6 Predicted contributions to nitrogen deposition have been calculated and compared with the relevant critical load range for the habitat types associated with the designated site. These have been derived from the APIS database.

Critical Loads – Acidification

D.7 The acid deposition rate, in equivalents $keq.ha^{-1}.year^{-1}$, has been calculated by multiplying the dry deposition flux ($kg.ha^{-1}.year^{-1}$) by a conversion factor of 0.071428 for N and adding the deposition rate for S.

D.8 The acid deposition rate for S has been calculated by multiplying the ground level SO_2 concentration by the deposition velocity to derive the deposition flux $\mu g.m^{-2}.s^{-1}$. For short habitats the deposition velocity is 0.012 $m.s^{-1}$ and for forests it is 0.024 $m.s^{-1}$.

D.9 This has then been multiplied by a conversion factor of 157.7 and 0.0625 (i.e. 9.86) to determine the acid deposition arising from S ($keq.ha^{-1}.year^{-1}$). This takes into account the degree to which a chemical species is acidifying, calculated as the proportion of N or S within the molecule.

D.10 The acid contribution from HCl has been added to the S contribution. The acid deposition rate for HCl has been calculated by multiplying the ground level HCl concentration by the deposition velocity to derive the deposition flux in units of $\mu g.m^{-2}.s$. For short habitats the deposition velocity is 0.025 $m.s^{-1}$ and for forests it is 0.060 $m.s^{-1}$. This has then been multiplied by a conversion factor of 8.63 to convert to $keq.ha^{-1}.year^{-1}$.

D.11 Wet deposition in the near field is not significant compared with dry deposition for N and S [16] and therefore for the purposes of this assessment, wet deposition has not been considered.

D.12 Predicted contributions to acid deposition have been calculated and compared with the critical load function for the habitat types associated with the designated site as derived from the APIS database.

Significance Criteria

D.13 The PCs and PECs have been compared against the relevant critical level/load, for the relevant habitat type/interest feature.

D.14 For LWSs, it states:

"*If your emissions meet both of the following criteria they're insignificant – you don't need to assess them any further:*

- *the short-term PC is less than 100% of the short-term environmental standard*
- *the long-term PC is less than 100% of the long-term environmental standard*

You don't need to calculate PEC for local nature sites. If your PC exceeds the screening criteria you need to do detailed modelling."

Results

D.15 The predicted annual-mean NO_X, SO_2 and NH_3 concentrations are compared with the critical levels in Table D.1.

D.16 The predicted daily-mean NOx and HF concentrations and weekly-mean HF concentrations are compared with the critical levels in Table D.2.

D.17 The predicted nutrient N deposition rates are compared with the critical load in Table D.3. The lowest critical loads for nitrogen deposition have been obtained from APIS.

D.18 The maximum predicted acid deposition rates are compared with the critical load function in Table D.4. The critical loads for the nitrogen and sulphur component for acid deposition have been also obtained from APIS.

Table D.1 Predicted Annual-Mean NOx, SO_2 and NH_3 Concentrations at Designated Habitat Sites ($\mu g.m^{-3}$)

Receptor ID	Habitat Site	Annual-mean NOx PC	PC as % of CL	Annual-mean SO_2 PC	PC as % of CL	Annual-mean NH_3 PC	PC as % of CL
-	**Critical Level**	**30**		**20**		**1**	
1	Brookfield Plantation (LWS)	0.14	0	0.04	0	0.014	1
2		0.16	1	0.05	0	0.016	2
3		0.19	1	0.06	0	0.019	2
4		0.17	1	0.05	0	0.017	2
5		0.15	0	0.04	0	0.015	1
6		0.14	0	0.04	0	0.014	1
7		0.14	0	0.04	0	0.014	1
8	Plantation Cutting (LWS)	0.10	0	0.03	0	0.010	1
9		0.09	0	0.03	0	0.009	1
10		0.08	0	0.02	0	0.008	1
11		0.07	0	0.02	0	0.007	1
12		0.07	0	0.02	0	0.007	1
13	Corby Tunnel Quarries (LWS)	0.11	0	0.03	0	0.011	1
14		0.11	0	0.03	0	0.011	1
15		0.10	0	0.03	0	0.010	1
16		0.10	0	0.03	0	0.010	1
17	Corby Old Quarry Gullet (LWS)	0.57	2	0.17	1	0.057	6
18		0.49	2	0.15	1	0.049	5
19		0.50	2	0.15	1	0.050	5
20		0.44	1	0.13	1	0.044	4
21		0.39	1	0.12	1	0.039	4
22	Corby Old Quarry Pond Brookfield (LWS)	0.38	1	0.11	1	0.038	4
23		0.32	1	0.10	0	0.032	3
24		0.30	1	0.09	0	0.030	3
25		0.26	1	0.08	0	0.026	3
26		0.24	1	0.07	0	0.024	2

Table D.2 Predicted Daily-Mean NOx and HF and Weekly-mean HF Concentrations at Designated Habitat Sites ($\mu g.m^{-3}$)

Receptor ID	Habitat Site	Daily-mean NOx PC	PC as % of CL	Daily-mean HF PC	PC as % of CL	Weekly-mean HF PC	PC as % of CL
-	**Critical Level**	**75**		**5**		**0.5**	
1	Brookfield Plantation (LWS)	12.90	17	0.03	1	1.07E-02	2
2		15.61	21	0.04	1	1.28E-02	3
3		17.59	23	0.04	1	1.44E-02	3
4		21.22	28	0.05	1	1.48E-02	3
5		19.68	26	0.05	1	9.12E-03	2
6		22.62	30	0.06	1	1.00E-02	2
7		30.30	40	0.08	2	1.03E-02	2
8	Plantation Cutting (LWS)	8.32	11	0.02	0	6.99E-03	1
9		8.16	11	0.02	0	6.80E-03	1
10		10.35	14	0.03	1	5.79E-03	1
11		5.89	8	0.01	0	4.33E-03	1
12		6.64	9	0.02	0	3.65E-03	1
13	Corby Tunnel Quarries (LWS)	11.95	16	0.03	1	6.06E-03	1
14		18.91	25	0.05	1	6.79E-03	1
15		20.60	27	0.05	1	6.73E-03	1
16		9.83	13	0.02	0	5.64E-03	1
17	Corby Old Quarry Gullet (LWS)	16.37	22	0.04	1	1.80E-02	4
18		13.61	18	0.03	1	1.59E-02	3
19		19.25	26	0.05	1	1.67E-02	3
20		12.39	17	0.03	1	1.14E-02	2
21		12.05	16	0.03	1	1.35E-02	3
22	Corby Old Quarry Pond Brookfield (LWS)	13.71	18	0.03	1	1.20E-02	2
23		9.38	13	0.02	0	9.12E-03	2
24		9.25	12	0.02	0	8.10E-03	2
25		8.16	11	0.02	0	6.99E-03	1
26		6.78	9	0.02	0	8.01E-03	2

Table D.3 Predicted Nutrient N Deposition at Designated Habitat Sites (kg.ha^{-1}.yr^{-1})

Receptor ID	Habitat Site	CL	N Deposition PC	PC as % of CL
1	Brookfield Plantation (LWS)	10	0.027	0
2		10	0.032	0
3		10	0.038	0
4		10	0.034	0
5		10	0.029	0
6		10	0.029	0
7		10	0.028	0
8	Plantation Cutting (LWS)	10	0.021	0
9		10	0.018	0
10		10	0.017	0
11		10	0.015	0
12		10	0.014	0
13	Corby Tunnel Quarries (LWS)	10	0.022	0
14		10	0.022	0
15		10	0.021	0
16		10	0.020	0
17	Corby Old Quarry Gullet (LWS)	20	0.057	0
18		20	0.049	0
19		20	0.051	0
20		20	0.045	0
21		20	0.039	0
22	Corby Old Quarry Pond Brookfield (LWS)	10	0.076	1
23		10	0.065	1
24		10	0.061	1
25		10	0.053	1
26		10	0.048	0

Table D.4 Predicted Acid Deposition at Designated Habitat Sites (keq.ha^{-1}.yr^{-1})

Receptor ID	Habitat Site	Min N CL	Max N CL	Max S CL	N PC	S PC	AC - N	AC - S	PEC - N	PEC - S	PC as % of CLF
1	Brookfield Plantation (LWS)	-	-	-	0.002	0.05	2.75	0.22	2.752	0.27	-
2		-	-	-	0.002	0.06	2.75	0.22	2.752	0.28	-
3		-	-	-	0.003	0.07	2.75	0.22	2.753	0.29	-
4		-	-	-	0.002	0.06	2.75	0.22	2.752	0.28	-
5		-	-	-	0.002	0.06	2.75	0.22	2.752	0.28	-
6		-	-	-	0.002	0.05	2.75	0.22	2.752	0.27	-
7		-	-	-	0.002	0.05	3.84	0.22	3.842	0.27	-
8	Plantation Cutting (LWS)	-	-	-	0.001	0.04	2.75	0.22	2.751	0.26	-
9		-	-	-	0.001	0.03	3.84	0.22	3.841	0.25	-
10		-	-	-	0.001	0.03	3.84	0.22	3.841	0.25	-
11		-	-	-	0.001	0.03	3.84	0.22	3.841	0.25	-
12		-	-	-	0.001	0.03	3.84	0.22	3.841	0.25	-
13	Corby Tunnel Quarries (LWS)	-	-	-	0.002	0.04	3.84	0.22	3.842	0.26	-
14		-	-	-	0.002	0.04	3.84	0.22	3.842	0.26	-
15		-	-	-	0.001	0.04	3.84	0.22	3.841	0.26	-
16		-	-	-	0.001	0.04	3.84	0.22	3.841	0.26	-
17	Corby Old Quarry Gullet (LWS)	0.856	4.856	4	0.004	0.09	1.63	0.18	1.634	0.27	2
18		0.856	4.856	4	0.004	0.08	1.63	0.18	1.634	0.26	2
19		0.856	4.856	4	0.004	0.08	1.63	0.18	1.634	0.26	2
20		0.856	4.856	4	0.003	0.07	1.63	0.18	1.633	0.25	2
21		1.071	5.071	4	0.003	0.06	1.63	0.18	1.633	0.24	1
22	Corby Old Quarry Pond Brookfield (LWS)	-	-	-	0.005	0.14	2.75	0.22	2.755	0.36	-
23		-	-	-	0.005	0.12	2.75	0.22	2.755	0.34	-
24		-	-	-	0.004	0.11	2.75	0.22	2.754	0.33	-
25		-	-	-	0.004	0.10	2.75	0.22	2.754	0.32	-
26		-	-	-	0.003	0.09	2.75	0.22	2.753	0.31	-

Interpretation of Results

Annual-mean NOx, SO_2 and NH_3

D.19 The maximum annual-mean NOx, SO_2 and NH_3 PCs do not exceed 100% of the critical level and the impacts can be screened out as insignificant.

Daily-mean NOx and HF

D.20 The maximum daily-mean NOx and HF PCs do not exceed 100% of the critical level and the impacts can be screened out as insignificant.

Weekly-mean HF

D.21 The maximum weekly-mean HF PC does not exceed 100% of the critical level and the impacts can be screened out as insignificant.

Nutrient N Deposition

D.22 The maximum nitrogen deposition PCs do not exceed 100% of the critical load and the impacts can be screened out as insignificant at all sites.

Acid Deposition

D.23 The maximum acid deposition PCs do not exceed 100% of the critical load and the impacts can be screened out as insignificant.

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16 Approaches to modelling local nitrogen deposition and concentrations in the context of Natura 2000 - Topic 4