Determination of an Application for an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2016

Decision document recording our decision-making process

The Permit Number is:	EPR/NP3608BQ
The Applicant / Operator is:	Uniper UK Limited
The Installation is located at:	EMERGE Centre Ratcliffe-on-Soar Power Station Ratcliffe-on-Soar Nottingham NG11 0EE

What this document is about

This is a decision document, which accompanies a permit.

It explains how we have considered the Applicant's Application, and why we have included the specific conditions in the permit we are issuing to the Applicant. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our position. Unless the document explains otherwise, we have accepted the Applicant's proposals.

We try to explain our decision as accurately, comprehensively and plainly as possible. Achieving all three objectives is not always easy, and we would welcome any feedback as to how we might improve our decision documents in future. A lot of technical terms and acronyms are inevitable in a document of this nature: we provide a glossary of acronyms near the front of the document, for ease of reference.

Preliminary information and use of terms

We gave the application the reference number EPR/NP3608BQ/A001. We refer to the application as "the **Application**" in this document in order to be consistent.

The number we have given to the permit is EPR/NP3608BQ. We refer to the permit as "the **Permit**" in this document.

The Application was duly made on 15/02/2021.

The Applicant is Uniper UK Limited. We refer to Uniper UK Limited as "the **Applicant**" in this document. Where we are talking about what would happen after the Permit is granted (if that is our final decision), we call Uniper UK Limited "the **Operator**".

Uniper UK Limited's proposed facility is located at EMERGE Centre, Ratcliffe-on-Soar Power Station, Ratcliffe-on-Soar, Nottingham, NG11 0EE. We refer to this as "the **Installation**" in this document.

How this document is structured

- Glossary of acronyms
- Our proposed decision
- How we reached our decision
- The legal framework
- The Installation
    - Description of the Installation and general issues
    - The site and its protection
    - Operation of the Installation – general issues
- Minimising the installation's environmental impact
    - Assessment Methodology
    - Air Quality Assessment
    - Human health risk assessment
    - Impact on Habitats sites, SSSIs, non-statutory conservation sites etc.
    - Impact of abnormal operations
    - Other Emissions
- Application of Best Available Techniques
    - Scope of Consideration
    - BAT and emissions control
    - BAT and global warming potential
    - BAT and POPs
    - Other Emissions to the Environment
    - Setting ELVs and other Permit conditions
    - Monitoring
    - Reporting
- Other legal requirements
    - The EPR 2016 and related Directives
    - National primary legislation
    - National secondary legislation
    - Other relevant legal requirements
- Annexes
    - Application of the Industrial Emissions Directive
    - Pre-Operational Conditions
    - Improvement Conditions
    - Consultation Reponses

Glossary of acronyms used in this document

(Please note that this glossary is standard for our decision documents and therefore not all these acronyms are necessarily used in this document.)

AAD	Ambient Air Directive (2008/50/EC)
APC	Air Pollution Control
AQS	Air Quality Strategy
AQAL	Air Quality Assessment Level,
BAT	Best Available Technique(s)
BAT-AEL	BAT Associated Emission Level
BREF	Best Available Techniques (BAT) Reference Documents for Waste Incineration
BAT C	BAT conclusions
CEM	Continuous emissions monitor
CFD	Computerised fluid dynamics
CHP	Combined heat and power
COMEAP	Committee on the Medical Effects of Air Pollutants
CROW	Countryside and rights of way Act 2000
CV	Calorific value
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DD	Decision document
EAL	Environmental assessment level
EIAD	Environmental Impact Assessment Directive (85/337/EEC)
ELV	Emission limit value
EMAS	EU Eco Management and Audit Scheme
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154) as amended
ES	Environmental standard
EWC	European waste catalogue
FGC	Flue gas cleaning
FSA	Food Standards Agency
GWP	Global Warming Potential
HHRAP	Human Health Risk Assessment Protocol
HPA	Health Protection Agency (now PHE – Public Health England)

HRA	Human Rights Act 1998
HW	Hazardous waste
HWI	Hazardous waste incinerator
IBA	Incinerator Bottom Ash
IED	Industrial Emissions Directive (2010/75/EU)
I-TEF	Toxic Equivalent Factors set out in Annex VI Part 2 of IED
I-TEQ	Toxic Equivalent Quotient calculated using I-TEF
LCV	Lower calorific value – also termed net calorific value
LfD	Landfill Directive (1999/31/EC)
LADPH	Local Authority Director(s) of Public Health
LOI	Loss on Ignition
MBT	Mechanical biological treatment
MSW	Municipal Solid Waste
MWI	Municipal waste incinerator
NOx	Oxides of nitrogen (NO plus NO_2 expressed as NO_2)
OTNOC	Other than normal operating conditions
PAH	Polycyclic aromatic hydrocarbons
PC	Process Contribution
PCB	Polychlorinated biphenyls
PEC	Predicted Environmental Concentration
PHE	Public Health England
POP(s)	Persistent organic pollutant(s)
PPS	Public participation statement
PR	Public register
PXDD	Poly-halogenated di-benzo-p-dioxins
PXB	Poly-halogenated biphenyls
PXDF	Poly-halogenated di-benzo furans
RDF	Refuse derived fuel
RGS	Regulatory Guidance Series
SAC	Special Area of Conservation
SCR	Selective catalytic reduction
SGN	Sector guidance note
SHPI(s)	Site(s) of High Public Interest
SNCR	Selective non-catalytic reduction

SPA(s)	Special Protection Area(s)
SS	Sewage sludge
SSSI(s)	Site(s) of Special Scientific Interest
SWMA	Specified waste management activity
TDI	Tolerable daily intake
TEF	Toxic Equivalent Factors
TGN	Technical guidance note
TOC	Total Organic Carbon
UHV	Upper heating value –also termed gross calorific value
UN_ECE	United Nations Environmental Commission for Europe
US EPA	United States Environmental Protection Agency
WFD	Waste Framework Directive (2008/98/EC)
WHO	World Health Organisation
WID	Waste Incineration Directive (2000/76/EC) – now superseded by IED

1 Our decision

We have decided to grant the Permit to the Applicant. This will allow it to operate the Installation, subject to the conditions in the Permit.

We consider that, in reaching that decision, we have taken into account all relevant considerations and legal requirements and that the permit will ensure that a high level of protection is provided for the environment and human health.

This Application is to operate an installation which is subject principally to the Industrial Emissions Directive (IED).

The Permit contains many conditions taken from our standard Environmental Permit template including the relevant Annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the permit, we have considered the Application and accepted the details are sufficient and satisfactory to make the standard condition appropriate. This document does, however, provide an explanation of our use of "tailor-made" or installation-specific conditions, or where our Permit template provides two or more options.

2 How we reached our decision

2.1 Receipt of Application

The Application was duly made on 15/02/2021. This means we considered it was in the correct form and contained sufficient information for us to begin our determination but not that it necessarily contained all the information we would need to complete that determination: see below.

The Applicant made no claim for commercial confidentiality. We have not received any information in relation to the Application that appears to be confidential in relation to any party.

2.2 Consultation on the Application

We carried out consultation on the Application in accordance with the EPR, our statutory PPS and our own internal guidance RGS Note 6 for Determinations involving Sites of High Public Interest. We consider that this process satisfies, and frequently goes beyond the requirements of the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, which are directly incorporated into the IED, which applies to the Installation and the Application. We have also taken into account our obligations under the Local Democracy,

Economic Development and Construction Act 2009 (particularly Section 23). This requires us, where we consider it appropriate, to take such steps as we consider appropriate to secure the involvement of representatives of interested persons in the exercise of our functions, by providing them with information, consulting them or involving them in any other way. In this case, our consultation already satisfies the Act's requirements.

We advertised the Application by a notice placed on our website, which contained all the information required by the IED, including telling people where and when they could see a copy of the Application. We also placed an advertisement in the Leicester Mercury (1/03/2021) and Nottingham Post 1/03/2021)

We made a copy of the Application and all other documents relevant to our determination (see below) available to view on our Public Register Trentside offices, Scarrington Road, West Bridgford, Nottingham, NG2 5BR. Anyone wishing to see these documents could do so and arrange for copies to be made.

We sent copies of the Application to the following bodies, which includes those with whom we have "Working Together Agreements":

- Local Authority planning – Nottinghamshire County Council
- Local Authority Environmental Health – Nottinghamshire County Council
- Food Standards Agency
- Civil Aviation Authority
- National Grid
- Health and Safety Executive
- Fire & Rescue service
- Director of Public Health & Public Health England

These are bodies whose expertise, democratic accountability and/or local knowledge make it appropriate for us to seek their views directly. Note under our Working Together Agreement with Natural England, we only inform Natural England of the results of our assessment of the impact of the installation on designated Habitats sites.

In addition to our advertising the Application, we undertook a programme of extended public consultation. Public surgeries were not held due to Covid 19 restrictions. Written comments were accepted by the Environment Agency beyond the formal consultation period. Further details along with a summary of consultation comments and our response to the representations we received can be found in Annex 4. We have taken all relevant representations into consideration in reaching our determination.

2.3 Requests for Further Information

Although we were able to consider the Application duly made, we did in fact need more information in order to determine it and issued information notices on 27/04/2021 and 20/07/2021. A copy of each information notice was placed on our public register.

In addition to our information notices, we received additional information during the determination from the applicant (email dated 17/09/2021). We made a copy of this information available to the public in the same way as the responses to our information notices.

We have consulted on our draft decision from 06/01/2022 to 03/02/2022. A summary of the consultation responses and how we have taken into account all relevant representations is shown in Annex 4B.

3 The legal framework

The Permit will be granted, under Regulation 13 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

- an *installation* and a *waste incineration plant* as described by the IED;
- an *operation* covered by the WFD, and
- subject to aspects of other relevant legislation which also have to be addressed.

We address some of the major legal requirements directly where relevant in the body of this document. Other requirements are covered in a section towards the end of this document.

We consider that, in granting the Permit, it will ensure that the operation of the Installation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.
We explain how we have addressed specific statutory requirements more fully in the rest of this document.

4 The Installation

4.1 Description of the Installation and related issues

4.1.1 The permitted activities

The Installation is subject to the EPR because it carries out an activity listed in Part 1 of Schedule 1 to the EPR:

- Section 5.1 Part A(1)(b) – incineration of non-hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity of 3 tonnes or more per hour.

The IED definition of "waste incineration plants" and "waste co-incineration plants" says that it includes:

> *"all incineration lines or co-incineration lines, waste reception, storage, on-site pre-treatment facilities, waste, fuel and air supply systems, boilers, facilities for the treatment of waste gases, on-site facilities for treatment or storage of residues and waste water, stacks, devices for controlling incineration or co-incineration operations, recording and monitoring incineration or co-incineration conditions."*

Many activities which would normally be categorised as "directly associated activities" for EPR purposes (see below), such as air pollution control plant, (including storage and preparation of treatment chemicals e.g. lime slaking), and the ash storage bunker, are therefore included in the listed activity description.

An installation may also comprise "directly associated activities", which at this Installation includes the generation of electricity using a steam turbine and a back up electricity generator for emergencies. These activities comprise one installation, because the incineration plant and the steam turbine are successive steps in an integrated activity.

Together, these listed and directly associated activities comprise the Installation.

4.1.2 The Site

The proposed installation is located on the site of Ratcliffe-on-Soar Power Station to the north of the A453 Remembrance Way. The installation location is towards the central northern end of the power station site, on an open area covering circa 4 hectares, on an area of the power station which has never previously been fully developed but has been utilised as an equipment laydown area and car park.

The locality is generally rural with the River Soar passing to the west of the site and River Trent to the north. Sensitive human receptors are located nearby, to the north east of the site is the village of Thrumpton, to the west is Redhill Marina and to the south west is East Midlands Parkway. Protected habitat receptor Lockington Marshes (SSSI) is located to the north west.

The Applicant submitted a plan which we consider is satisfactory, showing the site of the Installation and its extent. A plan is included in Schedule 7 to the Permit, and the Operator is required to carry on the permitted activities within the site boundary.

Further information on the site is addressed below at 4.3.

4.1.3 What the Installation does

The Applicant has described the facility as an Energy Recovery Facility. Our view is that for the purposes of IED (in particular Chapter IV) and EPR, the installation is a waste incineration plant because:

Notwithstanding the fact that energy will be recovered from the process; the process is nevertheless 'incineration' because it is considered that its main purpose is the thermal treatment of waste.

Waste will be delivered to the installation in covered vehicles or containers. The waste will be delivered to the enclosed tipping hall where it will be tipped into the waste bunker. A grab crane will be used to homogenise the waste and transfer it to feed hoppers that will feed the two moving grate furnaces where the waste will be incinerated.

The two lines of this incinerator each consist of a combustion chamber with a moving grate furnace. Combustion for each line will be controlled by feeding primary air through the grate and secondary air will be injected above the waste. The furnaces will be designed to ensure that the combustion gases are maintained, after the last injection of combustion air, to at least 850 ^{o}C for a minimum of two seconds. Combustion air will be drawn from the waste reception area to maintain negative pressure to ensure odour control. Emissions to air will be via a 110 m high stack and will be minimised by cleaning the waste combustion gases as follows:

- Oxides of nitrogen (NOx) will be abated using Selective Non-Catalytic Reduction (SNCR)
- Acid Gases will be abated using a lime abatement system
- Dioxins, mercury and volatiles are abated using activated carbon injection
- Particulate matter and metals are abated by bag filters

Hot gases from the incineration of waste will pass through a series of heat exchangers and superheaters and finally through an economiser. The economiser will be used to preheat feedwater before it is supplied to the boiler. The design of the boilers, following a computerised fluid dynamics assessment, will ensure that the flue gas temperature is quickly reduced to minimise the risk of dioxin reformation. The steam generated in the boilers will be fed to a steam turbine which will generate electricity. Water for steam generation will be sourced from the mains and treated by reverse osmosis prior to use in the boilers. Steam will be condensed in an air cooled condenser and recycled to the boiler. Process waste water will be re-used for quenching bottom ash.

After quenching in water, bottom ash will be stored in a storage area, before unloading onto vehicles in an enclosed building. Air pollution control (APC) residues will be stored in silos prior to removal from site in sealed tankers.

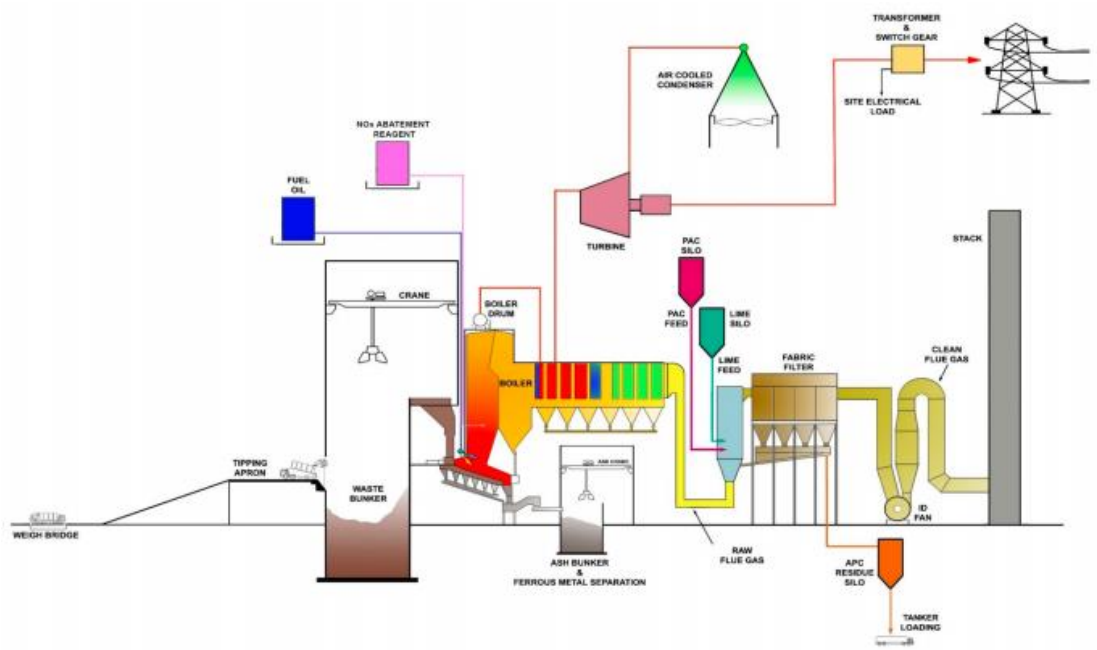
Under normal operation all process water will be re-used. In the case of abnormal operation, such as emptying of the boiler, effluent will be collected in a dirty water pit and tankered offsite for treatment by a third party. There are no discharges to sewer.

Surface water run-off from on-site roads, vehicle parking areas, roofs of buildings and other hardstanding; some of the roof water will be diverted to a rainwater harvesting tank located in the main building for use within the Installation. The remaining surface water run-off will pass through oil interceptors and silt traps prior to discharge into the Power Station’s existing surface water drainage system which discharges into the River Trent.

The Installation facility will generate electricity at a rate of 49.9 MWe. It is expected that ~ 6.5 MWe will be required to power the plant with ~ 43.4 MWe available for export to the national grid.

The facility will have the capability to provide ~ 8.7 MWth of heat should a viable combined heat a power scheme be established.

The operator will have an environmental management system and intends to have it certified to ISO 14001.



The key features of the Installation can be summarised in the table below.

Waste throughput, Tonnes/line	524,550 tonnes/year	33 tonnes/hour/per line
Waste processed	MSW, Wood, MBT res, RDF, Plastic,	
Number of lines	2	
Furnace technology	Moving Grate	
Auxiliary Fuel	Gas Oil	
Acid gas abatement	Dry/Semi-dry	Lime
NOx abatement	SNCR	Ammonia/urea
Reagent consumption	Auxiliary Fuel 472 te/annum Ammonia/Urea : 2,013te/annum or 888 te/annum Lime/Other : 8,557 te/annum or 7,606 te/annum Activated carbon: 472 te/annum Process water: 104,000 te/annum	
Flue gas recirculation	Yes	
Dioxin abatement	Activated carbon	
Stack	450435, 330403	
	Height, 110 m	Diameter, 2.75 m
Flue gas	Flow, 94.8 Nm^3/s	Velocity, 20 m/s
	Temperature 140°C	
Electricity generated	49.9 MWe	393,412 MWh
Electricity exported	43.4 MWe	342,245 MWh
Steam conditions	Temperature, 400 °C	Pressure, 40 bar

4.1.4 Key Issues in the Determination

The key issues arising during this determination were

- Assessment of BAT
- Assessment of air quality impacts on human health and ecological sites.
- Presence of Lockington Marshes Habitat site

We therefore describe how we determined these issues in most detail in this document.

4.2 The site and its protection

4.2.1 Site setting, layout and history

The Energy from Waste Installation operates separately to the main power station. The Installation is located within the north east area of the existing Ratcliffe-on-Soar Power Station site. The area where the Installation will be located has a historically commercial nature and the area is predominantly hardstanding. The area has never been fully developed but is known to have been used as a temporary equipment laydown and car parking area during the construction of the power station's Flue Gas Desulphurisation plant (FGD) and later the Selective Catalytic Reduction (SCR) plant. Though potential sources of contamination exist on the wider Power Station site, fuels / chemicals are not stored in close proximity to the Energy from Waste Installation boundary.
Made Ground is known to overlie the Branscombe Mudstone formation in the majority of the Power Station site, up to a maximum recorded thickness of 8.3 m. The Made Ground beneath the proposed Installation was recorded to be generally less than 1.5 m in depth, though up to 3 m deep in the north and the south of the Power Station site.
The River Trent is located approximately 600 m to the north-west of the Site and the River Soar is located approximately 1 km to the west of the Installation.
Site reports indicates that no historical pollution incidents have been identified within 500 m of the Installation, however a single historic spillage of gas oil is known from the wider Power Station site during 1999.

The Installation is situated on a secondary aquifer but it is not within a source protection zone. There are licensed groundwater abstractions within 1 km of the site which include those for Ratcliffe Power station.

4.2.2 Proposed site design: potentially polluting substances and prevention measures

Key control measures described in the Application are summarised below:

- The fuel oil, ammonia storage tanks and boiler treatment chemicals will be bunded and in an area with concrete hardstanding and contained drainage.
- Lime and activated carbon will be stored in silos in an area with concrete hardstanding and contained drainage.
- Tanker offloading of chemicals will take place in area with contained drainage.
- Spillage absorbent materials positioned in appropriate places around the site are available if required.
- Spillage procedures and staff training.
- Fire water will be contained using onsite drainage and containment infrastructure.

On this basis we consider the pollution risk to ground and groundwater to be insignificant.

Under Article 22(2) of the IED the Applicant is required to provide a baseline report containing at least the information set out in paragraphs (a) and (b) of the Article before starting operation.

The Applicant has not submitted a baseline report. We have therefore set a pre-operational condition (PO6) requiring the Operator to provide this information prior to the commencement of operations.

The baseline report is an important reference document in the assessment of contamination that might arise during the operational lifetime of the installation and at cessation of activities at the installation

4.2.3 Closure and decommissioning

Having considered the information submitted in the Application, we are satisfied that the appropriate measures will be in place for the closure and decommissioning of the Installation, as referred to in section 2.10 in supporting document UTG/20/PMP/513/R of the Application. Pre-operational condition PO1 requires the Operator to have an Environmental Management System in place before the Installation is operational, and this will include a site closure plan.

At the definitive cessation of activities, the Operator has to satisfy us that the necessary measures have been taken so that the site ceases to pose a risk to soil or groundwater, taking into accounts both the baseline conditions and the site's current or approved future use. To do this, the Operator will apply to us for surrender of the permit, which we will not grant unless and until we are satisfied that these requirements have been met.

4.3 Operation of the Installation – general issues

4.3.1 Administrative issues

The Applicant is the sole Operator of the Installation.

We are satisfied that the Applicant is the person who will have control over the operation of the Installation after the granting of the Permit; and that the Applicant will be able to operate the Installation so as to comply with the conditions included in the Permit.

4.3.2 Management

The Applicant has stated in the Application that they will implement an Environmental Management System (EMS) that will be certified under ISO14001. A pre-operational condition (PO1) is included requiring the Operator to provide a summary of the EMS prior to commissioning of the plant and to make available for inspection all EMS documentation. The Environment Agency recognises that certification of the EMS cannot take place until the Installation is operational. An improvement condition (IC1) is included requiring the Operator to report progress towards gaining accreditation of its EMS.

We are satisfied that appropriate management systems and management structures will be in place for this Installation, and that sufficient resources are available to the Operator to ensure compliance with all the Permit conditions.

4.3.3 Site security

Having considered the information submitted in the Application, we are satisfied that appropriate infrastructure and procedures will be in place to ensure that the site remains secure.

4.3.4 Accident management

The Applicant has not submitted an Accident Management Plan. However, having considered the other information submitted in the Application, we are satisfied that appropriate measures will be in place to ensure that accidents that may cause pollution are prevented but that, if they should occur, their consequences are minimised. An Accident Management Plan will form part of the Environmental Management System and must be in place prior to commissioning as required by a pre-operational condition (PO1).

The Applicant submitted a Fire Prevention Plan. We have reviewed the plan which outlined fire management specific to an incineration installation including but not limited to the use of a suitably designed and constructed bunker managed continuously by a crane operator trained preventing and managing fire risk. In addition, the site is fitted with fire detection, water cannons with sufficient water supply and firewater containment. On this basis

we are satisfied that the appropriate measures for fire prevention at a waste incineration plant will be implemented

4.3.5 Off-site conditions

We do not consider that any off-site conditions are necessary.

4.3.6 Operating techniques

We have specified that the Applicant must operate the Installation in accordance with the following documents contained in the Application:

Description	Parts Included	Justification
The Application	Application document supporting information reference UTG/20/PMP/513/R Supporting information document sections: Section 1.3, 1.4.1, 1.4.2 1.4.3, 1.4.4, 1.4.5, 1.4.6, 1.4.7, 1.4.8, 1.4.9, 2.1.1, 2.1.2 2.1.4, 2.2.2, 2.2.3, 2.2.4, 2.3.1, 2.3.2, 2.4.2, 2.4.3 (excluding odour abatement system) 2.4.4, 2.4.5, 2.5, 2.7, 2.8 Odour management plan	These documents outline the specific operational measures the operator will implement at the site to manage the environmental risk
Response to Schedule 5 Notice dated 27/04/2021	Responses to questions 4,5,6,7,8,9,10,11,13,14,15,16,17,19,20,22,23, 24,30,31,32,33,34,37,38	
Response to Schedule 5 Notice dated 20/07/2021	1,2	

The details set out above describe the techniques that will be used for the operation of the Installation that have been assessed by the Environment Agency as BAT; they form part of the Permit through Permit condition 2.3.1 and Table S1.2 in the Permit Schedules.

We have also specified the following limits and controls on the use of raw materials and fuels:

Raw Material or Fuel	Specifications	Justification
Fuel Oil	< 0.1% sulphur content	As required by Sulphur Content of Liquid Fuels Regulations.

Article 45(1) of the IED requires that the Permit must include a list of all types of waste which may be treated using at least the types of waste set out in the European Waste List established by Decision 2005/532/EC, EC, if possible, and containing information on the quantity of each type of waste, where appropriate. The Application contains a list of those wastes, coded by the European Waste Catalogue (EWC) number, which the Applicant will accept in the waste streams entering the plant and which the plant is capable of burning in an environmentally acceptable way. We have specified the permitted waste types, descriptions and where appropriate quantities which can be accepted at the installation in Table S2.2.

We are satisfied that the Applicant can accept the wastes contained in Table S2.2 of the Permit because: -

(i) these wastes are categorised as municipal waste in the European Waste Catalogue or are non-hazardous wastes similar in character to municipal waste;
(ii) the wastes are all categorised as non-hazardous in the European Waste Catalogue and are capable of being safely burnt at the installation.
(iii) these wastes are likely to be within the design calorific value (CV) range for the plant;
(iv) these wastes are unlikely to contain harmful components that cannot be safely processed at the Installation.

The incineration plant will take municipal waste, which has not been source-segregated or separately collected or otherwise recovered, recycled or composted. Waste codes for separately collected fractions of waste (with the exception of waste wood classified under EWC code 20 01 38) are not included in the list of permitted wastes, except that separately collected fractions which prove to be unsuitable for recovery may be included.

We have limited the capacity of the Installation to 524,550 tonnes per annum. This is based on the installation operating 7,884 hours per year at a nominal capacity of 33 tonnes per hour per incineration line. This limitation is based on the calorific value of the wastes, the plant capacity per hour, plant availability hours/year and the emissions resulting from the rate of processing

The Installation will be designed, constructed and operated using BAT for the incineration of the permitted wastes. We are satisfied that the operating and abatement techniques are BAT for incinerating these types of waste. Our assessment of BAT is set out later in this document.

4.3.7 Energy efficiency

(i) Consideration of energy efficiency

We have considered the issue of energy efficiency in the following ways:

1. The use of energy within, and generated by, the Installation which are normal aspects of all EPR permit determinations. This issue is dealt with in this section.

2. The extent to which the Installation meets the requirements of Article 50(5) of the IED, which requires *"the heat generated* during the incineration and co-incineration process is *recovered as far as practicable through the generation of heat, steam or power*". This issue is covered in this section.

3. The combustion efficiency and energy utilisation of different design options for the Installation are relevant considerations in the determination of BAT for the Installation, including the Global Warming Potential of the different options. This aspect is covered in the BAT assessment in section 6 of this Decision Document.

4. The extent to which the Installation meets the requirement of Article 14(5) of the Energy Efficiency Directive which requires new thermal electricity generation installations with a total thermal input exceeding 20 MW to carry out a cost-benefit assessment to "*assess the cost and benefits of providing for the operation of the installation as a high-efficiency cogeneration installation*".
   Cogeneration means the simultaneous generation in one process of thermal energy and electrical or mechanical energy and is also known as combined heat and power (CHP).
   High-efficiency co-generation is cogeneration which achieves at least 10% savings in primary energy usage compared to the separate generation of heat and power – see Annex II of the Energy Efficiency Directive for detail on how to calculate this.

(ii) Use of energy within the Installation

Having considered the information submitted in the Application, we are satisfied that appropriate measures will be in place to ensure that energy is used efficiently within the Installation.

The Application details a number of measures that will be implemented at the Installation in order to increase its energy efficiency,

- High efficiency motors
- High efficiency variable speed drives
- High standards of cladding and insulation
- Releases of steam and water minimised
- Operating and maintenance procedures to ensure energy efficient operation
- Operators trained in energy awareness and encouraged to identify opportunities for improvement.

The Application states that the specific energy consumption, a measure of total energy consumed per unit of waste processed, will be 110 kWh/tonne. The installation capacity is 524,550 t/a.

The BREF says that electricity consumption is typically between 60 KWh/t and 190 KWh/t depending on the LCV of the waste.

The LCV in this case is expected to be 9.0 MJ/kg. The specific energy consumption in the Application is in line with that set out above.

(iii) Generation of energy within the Installation - Compliance with Article 50(5) of the IED

Article 50(5) of the IED requires that *"the heat generated during the incineration and co-incineration process is recovered as far as practicable*".

Our CHP Ready Guidance - February 2013 considers that BAT for energy efficiency for Energy from Waste (EfW) plant is the use of CHP in circumstances where there are technically and economically viable opportunities for the supply of heat from the outset.

The term CHP in this context represents a plant which also provides a supply of heat from the electrical power generation process to either a district heating network or to an industrial / commercial building or process. However, it is recognised that opportunities for the supply of heat do not always exist from the outset (i.e. when a plant is first consented, constructed and commissioned).

In cases where there are no immediate opportunities for the supply of heat from the outset, the Environment Agency considers that BAT is to build the plant to be CHP Ready (CHP-R) to a degree which is dictated by the likely future opportunities which are technically viable and which may, in time, also become economically viable.

The BREF says that 0.4 – 0.8 MWh of electricity can be generated per tonne of waste.
Our technical guidance note, SGN EPR S5.01, states that where electricity only is generated, 5-9 MW of electricity should be recoverable per 100,000 tonnes/annum of waste (which equates to 0.4 – 0.72 MWh/tonne of waste).

The Installation will generate electricity only and has been specified to maximise electrical output with little or no use of waste heat. The Application indicates that 43.4 MWe of electricity will be produced for an annual burn of 524,550 tonnes, which represents 10.57 MW per 100,000 tonnes/yr of waste burned (0.72 MWh/tonne of waste). The Installation is therefore at the top end of the indicative BAT range.

The Applicant provided a calculation of the gross electrical efficiency and compared it to the BAT AEEL specified in BAT conclusions BAT 20.

The gross electrical efficiency was calculated as 31.1%.

The BAT AEEL for gross electrical efficiency is 25-35

The value calculated by the Applicant is towards the top of this range.
In accordance with BAT 2 table S3.3 of the Permit requires the gross electrical efficiency to be measured by carrying out a performance test at full load.

The SGN and Chapter IV of the IED both require that, as well as maximising the primary use of heat to generate electricity; waste heat should be recovered as far as practicable.

The Applicant has assessed the viability of supplying heat as well as electricity. The Applicant concluded that it is not viable at this time. Further details are in the section vii below.

The location of the Installation largely determines the extent to which waste heat can be utilised, and this is a matter for the planning authority. The Applicant carried out a feasibility study and provided a CHP-R assessment as part of their application, which showed there was potential to provide district heating to local businesses; suitable opportunities are being explored, though there are no firm commitments at this stage. There is provision within the design of the steam turbine to extract low-grade steam for a district heating scheme. Establishing a district heating network to supply local users would involve significant technical, financial and planning challenges such that this is not seen as a practicable proposition at present.

We consider that, within the constraints of the location of the Installation explained above, the Installation will recover heat as far as practicable, and therefore that the requirements of Article 50(5) are met.

(iv) R1 Calculation and the DEFRA Good Quality CHP Scheme

The R1 calculation does not form part of the matters relevant to our determination. It is however a general indicator that the installation is achieving a high level of energy recovery.

The Applicant has presented a calculation of the R1 factor in a separate R1 application (as defined under the WFD 2008). The R1 formula is a measure of the extent to which energy is recovered from incineration plant. The formula is:

$$R1 = (Ep – (Ef + Ei)) / (0.97 \times (Ew + Ef))$$

Where:

- Ep means annual energy produced as heat or electricity. It is calculated in the form of electricity being multiplied by 2.6 and heat for commercial use being multiplied by 1.1 (GJ/yr).
- Ef means annual energy input to the system from fuels contributing to the production of steam (GJ/yr).
- Ew means annual energy contained in the treated waste calculated using the net calorific value of the waste (GJ/yr).
- Ei means annual energy imported excluding Ew and Ef (GJ/yr)
- 0.97 is a factor accounting for energy losses due to bottom ash and radiation.

Where municipal waste incinerators can achieve an R1 factor of 0.65 or above, the plant will be considered to be a ‘recovery activity’ for the purposes of the Waste Framework Directive. Again whether or not an installation achieves an R1 score of >0.65 is not a matter directly relevant to this determination. However by being classified as a ‘recovery activity’ rather than as a ‘disposal activity’, the Operator could draw financial and other benefits.

The Applicant’s R1 factor based on design data was 0.76 which is well above the 0.65 required to be classed as recovery.

The R1 factor can only be determined from operational data over a full year. At application stage it is only possible to make a provisional assessment. Ep measures the energy recovered for use from the incinerator. This energy will have been recovered not just from the combustion of waste (Ew), but also from the combustion of the support fuel at start up and shut down and where required to maintain the 850 ºC combustion temperature (Ef). Ei is additional energy imported, which will primarily be electricity from the grid. These parameters will depend on the way in which the plant is operated, e.g. number of start ups and shut downs.

Note that the availability or non-availability of financial incentives for renewable energy such as the ROC and RHI schemes is not a consideration in determining this application.

(v) Choice of Steam Turbine

The proposal for the EMERGE Centre will represent high (advanced) steam conditions as stated in the BAT Conclusions (BAT 20, point f). The turbine inlet steam conditions will be around 430 °C and 60 bar representative of modern energy from waste plant, which provides an acceptable balance between plant efficiency and availability. The precise conditions will be finalised during engineering design. A heat recovery boiler, incorporating membrane tube walls, superheaters and an economiser, will be used.

(vi) Choice of Cooling System

The Applicant proposed an air cooled condenser cooling system. This was chosen above a water cooled or evaporative system on the basis of lower cost of installation and unable to utilise powerplant water cooling infrastructure, no environmental impact on River Trent compared to water cooled, small gains in efficiency and prevents potential conflict with HS2 on Construction and Operation and Potential Future Development on the Ratcliffe Site.

Considering this and the higher temperature and pressure steam conditions required for water cooling to be effective we agree that air cooled condenser are BAT for this Installation.

(vii) Compliance with Article 14(5) of the Energy Efficiency Directive

The operator subsequently submitted a cost-benefit assessment of opportunities for high efficiency co-generation within 15 km of the installation, in which they calculated net present value. If the NPV is positive (i.e. any number more than zero) it means that the investors will make a rate of return that makes the scheme commercially viable. A negative NPV means that the project will not be commercially viable.
The Applicant's assessment showed a net present value of [-18.43] which demonstrates that operating as a high-efficiency cogeneration installation will not be financially viable. We agree with the applicant's assessment and will not require the installation to operate as a high-efficiency cogeneration.

(viii) Permit conditions concerning energy efficiency

Pre-operational condition PO2 requires the Operator to carry out a comprehensive review of the available heat recovery options prior to commissioning, in order to ensure that waste heat from the plant is recovered as far as possible.

Conditions 1.2.2 and 1.2.3 have also been included in the Permit, which require the Operator to review the options available for heat recovery on an ongoing basis, and to provide and maintain the proposed steam/hot water pass-outs.

The Operator is required to report energy usage and energy generated under condition 4.2 and Schedule 5. The following parameters are required to be reported: total electrical energy generated; electrical energy exported; total energy usage and energy exported as heat (if any). Together with the total MSW burned per year, this will enable the Environment Agency to monitor energy recovery efficiency at the Installation and take action if at any stage the energy recovery efficiency is less than proposed.

There are no site-specific considerations that require the imposition of standards beyond indicative BAT, and so the Environment Agency accepts that the Applicant's proposals represent BAT for this Installation.

4.3.8 Efficient use of raw materials

Having considered the information submitted in the Application, we are satisfied that the appropriate measures will be in place to ensure the efficient use of raw materials and water.

The Operator is required to report with respect to raw material usage under condition 4.2 and Schedule 5, including consumption of lime, activated carbon and urea / ammonia used per tonne of waste burned. This will enable the Environment Agency to assess whether there have been any changes in the efficiency of the air pollution control plant, and the operation of the SNCR to abate NO_x. These are the most significant raw materials that will be used at the Installation, other than the waste feed itself (addressed elsewhere). The efficiency of the use of auxiliary fuel will be tracked separately as part of the energy reporting requirement under condition 4.2.2 Optimising reagent dosage for air abatement systems and minimising the use of auxiliary fuels is further considered in the section on BAT.

4.3.9 Avoidance, recovery or disposal with minimal environmental impact of wastes produced by the activities

This requirement addresses wastes produced at the Installation and does not apply to the waste being treated there. The principal waste streams the Installation will produce are bottom ash, air pollution control residues and recovered metals.

The first objective is to avoid producing waste at all. Waste production will be avoided by achieving a high degree of burnout of the ash in the furnace, which results in a material that is both reduced in volume and in chemical reactivity. Condition 3.1.4 and associated Table S3.4 specify limits for total organic carbon (TOC) of <3% / loss on ignition (LOI) of <5% in bottom ash. Compliance with this limit will demonstrate that good combustion control and waste burnout is being achieved in the furnaces and waste generation is being avoided where practicable.

Incinerator bottom ash (IBA) will normally be classified as non-hazardous waste. However, IBA is classified on the European List of Wastes as a "mirror entry", which means IBA is a hazardous waste if it possesses a hazardous property relating to the content of dangerous substances. Monitoring of incinerator ash will be carried out in accordance with the requirements of Article 53(3) of IED. Classification of IBA for its subsequent use or disposal is controlled by other legislation and so is not duplicated within the permit.

Air pollution control (APC) residues from flue gas treatment are hazardous waste and therefore must be sent for disposal to a landfill site permitted to accept hazardous waste, or to an appropriately permitted facility for hazardous waste treatment. The amount of APC residues is minimised through optimising the performance of the air emissions abatement plant.

In order to ensure that the IBA residues are adequately characterised, pre-operational condition PO3 requires the Operator to provide a written plan for approval detailing the ash sampling protocols. Table S3.4 requires the Operator to carry out an ongoing programme of monitoring.

The Application states that metal fractions will be recovered from the bottom ash by the use of a magnetic separator and sent for recycling. The Application also proposes that, where possible, bottom ash will be transported to a suitable recycling facility, from where it could be re-used in the construction industry as an aggregate.

Having considered the information submitted in the Application, we are satisfied that the waste hierarchy referred to in Article 4 of the WFD will be applied to the generation of waste and that any waste generated will be treated in accordance with this Article.

We are satisfied that waste from the Installation that cannot be recovered will be disposed of using a method that minimises any impact on the environment. Standard condition 1.4.1 will ensure that this position is maintained.

4.3.10 Climate change adaptation

We have assessed the climate change adaptation risk assessment.

We consider the climate change adaptation risk assessment is satisfactory.

We have decided to include a condition in the permit requiring the operator to review and update their climate change risk assessment over the life of the permit.

5. Minimising the Installation's environmental impact

Regulated activities can present different types of risk to the environment, these include odour, noise and vibration; accidents, fugitive emissions to air and water; as well as point source releases to air, discharges to ground or groundwater, global warming potential and generation of waste and other environmental impacts. Consideration may also have to be given to the effect of emissions being subsequently deposited onto land (where there are ecological receptors). All these factors are discussed in this and other sections of this document.

For an installation of this kind, the principal emissions are those to air, although we also consider those to land and water.

The next sections of this document explain how we have approached the critical issue of assessing the likely impact of the emissions to air from the Installation on human health and the environment and what measures we are requiring to ensure a high level of protection.

5.1 Assessment Methodology

5.1.1 Application of Environment Agency guidance 'risk assessments for your environmental permit'

A methodology for risk assessment of point source emissions to air, which we use to assess the risk of applications we receive for permits, is set out in our guidance 'Air emissions risk assessment for your environmental permit' and has the following steps:

- Describe emissions and receptors
- Calculate process contributions
- Screen out insignificant emissions that do not warrant further investigation
- Decide if detailed air modelling is needed
- Assess emissions against relevant standards
- Summarise the effects of emissions

The methodology uses a concept of “process contribution (PC)”, which is the estimated concentration of emitted substances after dispersion into the receiving environmental media at the point where the magnitude of the concentration is greatest. The methodology provides a simple method of calculating PC primarily for screening purposes and for estimating process contributions where environmental consequences are relatively low. It is based on using dispersion factors. These factors assume worst case dispersion conditions with no allowance made for thermal or momentum plume rise and so the process contributions calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of process contributions can be achieved by mathematical dispersion models, which take into account relevant parameters of the release and surrounding conditions, including local meteorology – these techniques are expensive but normally lead to a lower prediction of PC.

5.1.2 Use of Air Dispersion Modelling

For incineration applications, we normally require the Applicant to submit a full air dispersion model as part of their application. Air dispersion modelling enables the process contribution to be predicted at any environmental receptor that might be impacted by the plant.

Once short-term and long-term PCs have been calculated in this way, they are compared with Environmental Standards (ES). ES are described in our web guide ‘Air emissions risk assessment for your environmental permit’.

Our web guide sets out the relevant ES as:

- Ambient Air Directive Limit Values
- Ambient Air Directive and 4th Daughter Directive Target Values
- UK Air Quality Strategy Objectives
- Environmental Assessment Levels

Where an Ambient Air Directive (AAD) Limit Value exists, the relevant standard is the AAD Limit Value. Where an AAD Limit Value does not exist, AAD target values, UK Air Quality Strategy (AQS) Objectives or Environmental Assessment Levels (EALs) are used. Our web guide sets out EALs which have been derived to provide a similar level of protection to Human Health and the Environment as the AAD limit values, AAD target and AQS objectives. In a very small number of cases, e.g. for emissions of lead, the AQS objective is more stringent that the AAD value. In such cases, we use the AQS objective for our assessment.

AAD target values, AQS objectives and EALs do not have the same legal status as AAD limit values, and there is no explicit requirement to impose stricter conditions than BAT in order to comply with them. However, they are a standard for harm and any significant contribution to a breach is likely to be unacceptable.

PCs are screened out as **insignificant** if:

- the **long-term** process contribution is less than **1%** of the relevant ES; and
- the **short-term** process contribution is less than **10%** of the relevant ES.

The **long term** 1% process contribution insignificance threshold is based on the judgements that:

- It is unlikely that an emission at this level will make a significant contribution to air quality;
- The threshold provides a substantial safety margin to protect health and the environment.

The **short term** 10% process contribution insignificance threshold is based on the judgements that:

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions;
- the threshold provides a substantial safety margin to protect health and the environment.

Where an emission is screened out in this way, we would normally consider that the Applicant's proposals for the prevention and control of the emission to be BAT. That is because if the impact of the emission is already insignificant, it follows that any further reduction in this emission will also be insignificant.

However, where an emission cannot be screened out as insignificant, it does not mean it will necessarily be significant.

For those pollutants which do not screen out as insignificant, we determine whether exceedences of the relevant ES are likely. This is done through detailed audit and review of the Applicant's air dispersion modelling taking background concentrations and modelling uncertainties into account. Where an exceedance of an AAD limit value is identified, we may require the Applicant to go beyond what would normally be considered BAT for the Installation or we may refuse the application if the applicant is unable to provide suitable proposals. Whether or not exceedences are considered likely, the application is subject to the requirement to operate in accordance with BAT.

This is not the end of the risk assessment, because we also take into account local factors (for example, particularly sensitive receptors nearby such as a SSSIs, SACs or SPAs). These additional factors may also lead us to include more stringent conditions than BAT.

If, as a result of reviewing of the risk assessment and taking account of any additional techniques that could be applied to limit emissions, we consider that emissions **would cause significant pollution**, we would refuse the Application.

5.2 Assessment of Impact on Air Quality

The Applicant's assessment of the impact of air quality is set out in the Application. The assessment comprises:

- A screening assessment using the Environment Agency screening tool of emissions to air from the operation of the incinerator.
- Dispersion modelling of emissions to air from the operation of the incinerator.
- A study of the impact of emissions on nearby sensitive habitat / conservation sites.

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the incinerator chimney and its impact on local air quality. The impact on conservation sites is considered in section 5.4 and potential odour impacts including those during plant shutdowns are considered in section 6.5.4.

The Applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on local air quality from the Installation's stack emissions using the ADMS 5.2 dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model used 5 years of meteorological data collected from the weather station at Sutton Bonington between 2015 and 2019. Sutton Bonington is located approximately 3.5 km to the south of the Installation and recommended by the Meteorological Office as the most representative site for modelling an installation at the Ratcliffe power station site. The impact of the terrain surrounding the site upon plume dispersion was considered in the dispersion modelling.

The air impact assessments, and the dispersion modelling upon which they were based, employed the following assumptions.

- First, they assumed that the ELVs in the Permit would be the maximum permitted by Article 15(3), Article 46(2) and Annex VI of the IED. These substances are:
    - Oxides of nitrogen (NO_x), expressed as NO_2
    - Total dust
    - Carbon monoxide (CO)
    - Sulphur dioxide (SO_2)
    - Hydrogen chloride (HCl)
    - Hydrogen fluoride (HF)
    - Metals (Cadmium, Thallium, Mercury, Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel and Vanadium)
    - Polychlorinated dibenzo-para-dioxins and polychlorinated dibenzo furans (referred to as dioxins and furans)
    - Gaseous and vaporous organic substances, expressed as Total Organic Carbon (TOC)
    - Ammonia (NH_3)

- Second, they assumed that the Installation operates continuously at the relevant long-term or short-term ELVs, i.e. the maximum permitted emission rate (except for emissions of arsenic, chromium and nickel, which are considered in section 5.2.3 of this decision document).

- Third, the model also considered emissions of pollutants not covered by Annex VI of IED, specifically, polycyclic aromatic hydrocarbons (PAH) and Polychlorinated biphenyls (PCBs). Emission rates used in the modelling have been drawn from data in the Waste Incineration BREF.

We are in agreement with this approach. The assumptions underpinning the model have been checked and are reasonably precautionary.

The consultant has used background pollutant concentrations from a variety of data sources: local authority monitoring, Defra modelled background maps; rural heavy metals and polycyclic aromatics networks, acid gas and aerosol network and toxic organic micro pollutants network, and APIS[1].

Annual air quality reports for all five relevant local authorities have been reviewed to identify any monitoring sites located within 5 km of the proposed location of the energy facility. The automatic and diffusion tube monitoring sites identified together with the annual mean concentrations measured since 2013. A selection of closest relevant diffusion tubes for each pollutant were selected within 5 km of the Installation.
Department for Environment Food and Rural Affairs (DEFRA) provides modelled background concentrations of pollutants across the UK on a 1 km by 1 km grid. The applicant calculated the maximum mapped background concentration within the modelling domain from the 2017 mapped background concentrations.
The monitoring site to measure carbon monoxide concentrations is over 100 km away from the Installations location. Therefore, the maximum annual mean carbon monoxide concentration within the assessments modelling domain from the LAQM mapped background concentrations in 2001 has been used as a conservative estimate of baseline concentrations of carbon monoxide.

As well as calculating the peak ground level concentration, the Applicant has modelled the concentration of key pollutants at a number of specified locations within the surrounding area.

The way in which the Applicant used dispersion models, its selection of input data, use of background data and the assumptions it made have been reviewed by the Environment Agency's modelling specialists to establish the robustness of the Applicant's air impact assessment. The output from the model has then been used to inform further assessment of health impacts and impact on habitats and conservation sites.

[1] Air Pollution Information System (APIS) website. Available at www.apis.ac.uk

Our review of the Applicant's assessment leads us to agree with the Applicant's conclusions. We have also audited the air quality and human health impact assessment and similarly agree that the conclusions drawn in the reports were acceptable.

The Applicant's modelling predictions are summarised in the following sections.

5.2.1 Assessment of Air Dispersion Modelling Outputs

The Applicant's modelling predictions are summarised in the tables below.

The Applicant's modelling predicted peak ground level exposure to pollutants in ambient air and at discreet receptors. The tables below show the ground level concentrations at the most impacted receptor.

Whilst we have used the Applicant's modelling predictions in the table below, we have made our own simple verification calculation of the percentage process contribution and predicted environmental concentration. These are the numbers shown in the tables below and so may be very slightly different to those shown in the Application. Any such minor discrepancies do not materially impact on our conclusions.

Assessment of Emissions to Air from Incinerator

Pollutant	EQS / EAL		Back-ground (1)	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m³	Reference period	µg/m³	µg/m³	% of EAL	µg/m³	% of EAL
NO_2	40	Annual Mean	24.6	0.23	0.58	24.8	62.1
	200	99.79th %ile of 1-hour means	49.2	11.5	5.8	60.7	30.4
PM_{10}	40	Annual Mean	18.7	0.015	0.04	18.7	46.8
	50	90.41st %ile of 24-hour means	37.4	0.29	0.58	37.69	75.4
$PM_{2.5}$	20	Annual Mean	11.9	0.015	0.08	11.92	59.6
SO_2	266	99.9th %ile of 15-min means	4.8	21.7	8.2	26.5	10.0
	350	99.73rd %ile of 1-hour means	4.8	15	4.29	19.8	5.7

	125	99.18th %ile of 24-hour means	4.8	6.3	5.0	11.1	8.9
HCl	750	1-hour average	0.84	8.52	1.136	9.4	1.25
HF	16	Annual Mean	2.35	0.0026	0.02	2.353	14.70
	160	1-hour average	4.7	0.57	0.35625	5.27	3.3
CO	10000	Maximum daily running 8-hour mean	916	8.4	0.08	924	9.2
	30000	1-hour average	916	14.2	0.05	930	3.1
TOC	2.25	Annual Mean	0.35	0.029	1.29	0.38	16.84
	195	1-hour average	1.62	2.84	1.46	4.46	2.29
PAH	0.00025	Annual Mean	0.0036	5.8E-07	0.23	0.00360	1440.2
NH_3	180	Annual Mean	5.3	0.028	0.02	5.33	2.96
	2500	1-hour average	10.6	1.42	0.06	12.02	0.5
PCBs	0.2	Annual Mean	0.00013	1.7E-10	0.00	0.00013	0.07
	6	1-hour average	0.00026	1.2E-08	0.00	0.00026	0.00

TOC as 1,3 butadiene for long term and benzene for short term
PAH as benzo[a]pyrene

Pollutant	**EQS / EAL**		**Back-ground** (1)	**Process Contribution**		**Predicted Environmental Concentration**	
	ng/m³	**Reference period**	**ng/m³**	**ng/m³**	**% of EAL**	**ng/m³**	**% of EAL**
Cd	5	Annual mean	2.5	0.056	1.1	2.56	51.1
Tl							
Hg	250	Annual mean	19	0.056	0.02	19.06	7.62
	7500	1-hour average	38	5	0.07	43.00	0.573
Sb	5000	Annual mean	1.5	0.88	0.02	2.38	0.05
	150000	1-hour average	3	45	0.03	48.00	0.032
Pb	250	Annual mean	63	0.88	0.35	63.88	25.55

Co							
Cu	10000	Annual mean	80	0.88	0.01	80.88	0.809
	200000	1-hour average	16	45	0.02	61.00	0.031
Mn	150	Annual mean	110	0.88	0.59	110.88	73.92
	1500000	1-hour average	220	45	0.003	265.00	0.02
V	5000	Annual mean	12	0.88	0.02	12.88	0.26
	1000	24-hr average	24	45	4.50	69.00	6.90
As	3	Annual mean	1.2	0.88	29.33	2.08	69.3
Cr (II)(III)	5000	Annual mean	15	0.88	0.02	15.88	0.318
	150000	1-hour average	30	45	0.03	75.00	0.0500
Cr (VI)	0.2	Annual mean	3.00000	0.88	440.00	3.88	1940.0
Ni	20	Annual mean	4.1	0.8800	4.40	4.98	24.9

Note (1) – backgrounds data years include some with 100% operation of Ratcliffe Power Station which operates significant less hours at present.

(i) Screening out emissions which are insignificant

From the tables above the following emissions can be screened out as insignificant in that the process contribution is < 1% of the long term ES and <10% of the short term ES. These are:

- NO_2
- PM_{10}
- $PM_{2.5}$
- SO_2
- HCl
- HF
- CO
- TOC 1-hour average (benzene)
- PAH
- NH_3
- PCBs
- The following metals Hg, Sb, Pb, Cu, Mn, V, Cr (II)(III)

Therefore, we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation subject to the detailed audit referred to below.

(ii) Emissions unlikely to give rise to significant pollution

Also, from the tables above the following emissions (which were not screened out as insignificant) have been assessed as being unlikely to give rise to significant pollution in that the predicted environmental concentration is less than 100% (taking expected modelling uncertainties into account) of both the long term and short term ES.

- Cr (VI)
- Ni
- As
- Cd
- TOC (1,3 butadiene)

For these emissions, we have carefully scrutinised the Applicant's proposals to ensure that they are applying the Best Available Techniques to prevent and minimise emissions of these substances. This is reported in section 6 of this document.

(iii) Emissions requiring further assessment

Finally, from the tables above the following emissions are considered to have the potential to give rise to pollution in that the Predicted Environmental Concentration exceeds 100% of the long term or short term ES.

- Annual mean chromium (VI).

For these emissions, the Applicant has argued that the process contribution to the predicted environmental concentration is negligible. This is on the following basis.

Chromium VI was initially calculated above on the basis of 100% of the group 3 metal ELV being allocated to each metal species. This is an initial conservative estimate (worst case) to screen out metal emissions. The Applicant therefore proceeded to use Environment Agency Guidance on Assessing Group 3 Metals from incinerators to determine the PCs and PECs for these metals. This guidance utilises emissions data which has been measured by the EA at municipal waste incinerators and uses these values to assess the emissions based on realistic measured data.

The Applicant's modelling report showed that with the revised annual mean process contributions and predicted environmental concentrations for chromium (VI) using the maximum, mean and minimum emission concentrations specified with the EA Guidance on Assessing Group 3 Metals from incinerators, the process contributions are all below 1 % of the EAL and, therefore, can be classed as insignificant. On this basis no exceedences of the relevant environmental standards were predicted.

As part of our detailed audit of the Applicant's modelling assessment, we agree with the Applicant's conclusions in this respect taking modelling uncertainties into account.

In addition, with respect to these pollutants, we have carefully scrutinised the Applicant's proposals to ensure that they are applying the Best Available Techniques to prevent and minimise emissions of these substances. This is reported in section 6 of this document.

Assessment of Emissions to Air from Incinerator and Power Station

There is the potential for a period of overlap in operation between the time the incineration plant is commissioned and the power station ceases to operate. The applicant has therefore modelled the incinerator and power station in combination. The Applicant's modelling predictions are summarised in the tables below.

The Applicant's modelling predicted peak ground level exposure to pollutants in ambient air and at discreet receptors. The tables below show the ground level concentrations at the most impacted receptor.

Whilst we have used the Applicant's modelling predictions in the table below, we have made our own simple verification calculation of the percentage process contribution and predicted environmental concentration. These are the numbers shown in the tables below and so may be very slightly different to those shown in the Application. Any such minor discrepancies do not materially impact on our conclusions.

Pollutant	**EQS / EAL**		**Back-ground (1)**	**Process Contribution (PC)**		**Predicted Environmental Concentration (PEC)**	
	µg/m³	**Reference period**	**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
NO_2	40	Annual Mean	24.6	0.67	1.68	25.3	63.2
	200	99.79th %ile of 1-hour means	49.2	32	16.0	81.2	40.6
PM_{10}	40	Annual Mean	18.7	0.063	0.16	18.8	46.9
	50	90.41st %ile of 24-hour means	37.4	3.15	6.30	40.55	81.1
$PM_{2.5}$	20	Annual Mean	11.9	0.063	0.32	11.96	59.8
SO_2	266	99.9th %ile of 15-min means	4.8	105.6	39.7	110.4	41.5
	350	99.73rd %ile of 1-hour means	4.8	70.7	20.20	75.5	21.6

	125	99.18th %ile of 24-hour means	4.8	23.4	18.7	28.2	22.6
HCl	750	1-hour average	0.84	8.61	1.148	9.5	1.26
HF	16	Annual Mean	2.35	0.018	0.11	2.368	14.80
	160	1-hour average	4.7	2.21	1.38125	6.91	4.3
CO	10000	Maximum daily running 8-hour mean	916	77.2	0.77	993	9.9
	30000	1-hour average	916	126.8	0.42	1043	3.5
TOC	2.25	Annual Mean	0.35	0.029	1.29	0.38	16.84
	195	1-hour average	1.62	2.84	1.46	4.46	2.29
PAH	0.00025	Annual Mean	0.0036	5.80E-07	0.23	0.00360	1440.2
NH_3	180	Annual Mean	5.3	0.035	0.02	5.34	2.96
	2500	1-hour average	10.6	1.76	0.07	12.36	0.5
PCBs	0.2	Annual Mean	0.00013	1.70E-10	0.00	0.00013	0.07
	6	1-hour average	0.00026	1.20E-08	0.00	0.00026	0.00

TOC as 1,3 butadiene for long term and benzene for short term
PAH as benzo[a]pyrene

Pollutant	EQS / EAL		Back-ground (1)	Process Contribution		Predicted Environmental Concentration	
	ng/m³	Reference period	ng/m³	ng/m³	% of EAL	ng/m³	% of EAL
Cd	5	Annual mean	2.5	0.056	1.1	2.56	51.1
Tl							
Hg	250	Annual mean	19	0.0098	0.00	19.01	7.60
	7500	1-hour average	38	1.21	0.02	39.21	0.523
Sb	5000	Annual mean	1.5	0.88	0.02	2.38	0.05
	150000	1-hour average	3	45	0.03	48.00	0.032
Pb	250	Annual mean	63	0.88	0.35	63.88	25.55
Co							
Cu	10000	Annual mean	80	0.88	0.01	80.88	0.809
	200000	1-hour average	16	45	0.02	61.00	0.031
Mn	150	Annual mean	110	0.88	0.59	110.88	73.92
	1500000	1-hour average	220	45	0.003	265.00	0.02
V	5000	Annual mean	12	0.88	0.02	12.88	0.26
	1000	24-hr average	24	45	4.50	69.00	6.90
As	3	Annual mean	1.2	0.88	29.33	2.08	69.3
Cr (II)(III)	5000	Annual mean	15	0.88	0.02	15.88	0.318
	150000	1-hour average	30	45	0.03	75.00	0.0500
Cr (VI)	0.2	Annual mean	3.00000	0.88	440.00	3.88	1940.0
Ni	20	Annual mean	4.1	0.8800	4.40	4.98	24.9

Note (1) – backgrounds data years include some with 100% operation of Ratcliffe Power Station which operates significant less hours at present.

(i) Screening out emissions which are insignificant

From the tables above the following emissions can be screened out as insignificant in that the process contribution is < 1% of the long term ES and <10% of the short term ES. These are:

- PM_{10}
- $PM_{2.5}$
- HCl
- HF
- CO
- TOC 1-hour average (benzene)
- PAH
- NH_3
- PCBs
- The following metals Hg, Sb, Pb, Cu, Mn, V, Cr (II)(III)

Therefore, we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation subject to the detailed audit referred to below.

(ii) Emissions unlikely to give rise to significant pollution

Also, from the tables above the following emissions (which were not screened out as insignificant) have been assessed as being unlikely to give rise to significant pollution in that the predicted environmental concentration is less than 100% (taking expected modelling uncertainties into account) of both the long term and short term ES.

- NO_2
- SO_2
- Ni
- As
- Cd
- TOC (1,3 butadiene)

For these emissions, we have carefully scrutinised the Applicant's proposals to ensure that they are applying the Best Available Techniques to prevent and minimise emissions of these substances. This is reported in section 6 of this document.

(iii) Emissions requiring further assessment

Finally, from the tables above the following emissions are considered to have the potential to give rise to pollution in that the Predicted Environmental Concentration exceeds 100% of the long term or short term ES.

- Annual mean chromium (VI).

For these emissions, the Applicant has argued that the process contribution to the predicted environmental concentration is negligible. This is on the following basis.

Chromium VI was initially calculated above on the basis of 100% of the group 3 metal ELV being allocated to each metal species. This is an initial conservative estimate (worst case) to screen out metal emissions. The Applicant therefore proceeded to use Environment Agency Guidance on Assessing Group 3 Metals from incinerators to determine the PCs and PECs for these metals. This guidance utilises emissions data which has been measured by the EA at municipal waste incinerators and uses these values to assess the emissions based on realistic measured data.

The Applicant's modelling report showed that with the revised annual mean process contributions and predicted environmental concentrations for chromium (VI) using the maximum, mean and minimum emission concentrations specified with the EA Guidance on Assessing Group 3 Metals from incinerators, the process contributions are all below 1 % of the EAL and, therefore, can be classed as insignificant. On this basis no exceedences of the relevant environmental standards were predicted.

As part of our detailed audit of the Applicant's modelling assessment, we agree with the Applicant's conclusions in this respect taking modelling uncertainties into account.

In addition, with respect to these pollutants, we have carefully scrutinised the Applicant's proposals to ensure that they are applying the Best Available Techniques to prevent and minimise emissions of these substances. This is reported in section 6 of this document.

5.2.2 Consideration of key pollutants

(i) Nitrogen dioxide (NO_2)

The impact on air quality from NO_2 emissions has been assessed against the ES of 40 $\mu g/m^3$ as a long term annual average and a short term hourly average of 200 $\mu g/m^3$. The model assumes a 70% NO_X to NO_2 conversion for the long term and 35% for the short term assessment in line with Environment Agency guidance on the use of air dispersion modelling.

The above incinerator only tables show that the peak long term PC is less than 1% of the ES and the peak short term PC is less than 10% of the ES and so can be screened out as insignificant. Therefore, we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

The above incinerator and power station tables show that the peak long term PC is greater than 1% of the ES and therefore cannot be screened out as insignificant. Even so, from the tables above, the peak long term emission is still not expected to result in the long term ES being exceeded. The peak short term PC is marginally above the level that would screen out as insignificant (>10% of the ES). However it is not expected to result in the short term ES being exceeded. This scenario will only potentially occur during a short term operational overlap of around 9 months for the existing power station and the Installation. The Applicant is required to prevent, minimise and control NO_2 emissions using BAT, this is considered further in Section 6. We are satisfied that NO_2 emissions will not result in significant pollution.

(ii) Particulate matter PM_{10} and $PM_{2.5}$

The impact on air quality from particulate emissions has been assessed against the ES for PM_{10} (particles of 10 microns and smaller) and $PM_{2.5}$ (particles of 2.5 microns and smaller). For PM_{10}, the ES are a long term annual average of 40 $\mu g/m^3$ and a short term daily average of 50 $\mu g/m^3$. For $PM_{2.5}$ the ES of 20 $\mu g/m^3$ as a long-term annual average was used, having changed from 25 $\mu g/m^3$ in 2020.

The Applicant's predicted impact of the Installation against these ESs is shown in the tables above. The assessment assumes that **all** particulate emissions are present as PM_{10} for the PM_{10} assessment and that **all** particulate emissions are present as $PM_{2.5}$ for the $PM_{2.5}$ assessment.

The above assessment is considered to represent a worst case assessment in that: -

- It assumes that the plant emits particulates continuously at the IED Annex VI limit for total dust, whereas actual emissions from similar plant are normally lower.
- It assumes all particulates emitted are below either 10 microns (PM_{10}) or 2.5 microns ($PM_{2.5}$), when some are expected to be larger.

We have reviewed the Applicant's particulate matter impact assessment and are satisfied in the robustness of the Applicant's conclusions.

The above assessment shows that the predicted process contribution for emissions of PM_{10} is below 1% of the long term ES and below 10% of the short term ES and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of particulates to be BAT for the Installation.

The above assessment also shows that the predicted process contribution for emissions of $PM_{2.5}$ is also below 1% of the ES. Therefore, the Environment Agency concludes that particulate emissions from the installation, including emissions of PM_{10} or $PM_{2.5}$, will not give rise to significant pollution.

(iii) Acid gases, SO_2, HCl and HF

From the tables above, emissions of HCl and HF can be screened out as insignificant in that the process contribution is <10% of the short term ES. There is no long term ES for HCl. HF has 2 assessment criteria – a 1-hr ES and a monthly EAL – the process contribution is <1% of the monthly EAL and so the emission screens out as insignificant if the monthly ES is interpreted as representing a long term ES.

There is no long term EAL for SO_2 for the protection of human health. Protection of ecological receptors from SO_2 for which there is a long term ES is considered in section 5.4.

The above incinerator only tables show that emissions of SO_2 can also be screened out as insignificant in that the short term process contribution is also <10% of each of the three short term ES values. Therefore, we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

The above incinerator and power station tables show that whilst SO_2 emissions cannot be screened out as insignificant, the Applicant's modelling shows that the installation is unlikely to result in a breach of the ES. This scenario will only potentially occur during a short term operational overlap of around 9 months for the existing power station and the Installation. The Applicant is required to prevent, minimise and control SO_2 emissions using BAT, this is considered further in Section 6. We are satisfied that SO_2 emissions will not result in significant pollution.

(iv) Emissions to Air of CO, VOCs, PAHs, PCBs, Dioxins and NH_3

The above tables show that for CO and VOC emissions, the peak short term PC is less than 10% of the ES and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

The above tables show that for VOC emissions, the peak long term PC is greater than 1% of the ES and therefore cannot be screened out as insignificant. Even so, from the table above, the emission is not expected to result in the ES being exceeded.

The Applicant has used the ES for 1,3 butadiene for their assessment of the impact of VOC. This is based on 1,3 butadiene having the lowest ES of organic species likely to be present in VOC (other than PAH, PCBs, dioxins and furans).

The above tables show that for PAH and PCB emissions, the peak long term PC is less than 1% of the ES and the peak short term PC is less than 10% of the ES for PCBs and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

The Applicant has also used the ES for benzo[a]pyrene (BaP) for their assessment of the impact of PAH. We agree that the use of the BaP ES is sufficiently precautionary.

There is no ES for dioxins and furans as the principal exposure route for these substances is by ingestion and the risk to human health is through the accumulation of these substances in the body over an extended period of time. This issue is considered in more detail in section 5.3

From the tables above all the other emissions can be screened out as insignificant in that the process contribution is < 1% of the long term ES and <10% of the short term ES.

The ammonia emission is based on a release concentration of 10 mg/m^3. We are satisfied that this level of emission is consistent with the operation of a well controlled SNCR NO_x abatement system.

Whilst all emissions cannot be screened out as insignificant, the Applicant's modelling shows that the installation is unlikely to result in a breach of the EAL. The Applicant is required to prevent, minimise and control PAH and VOC emissions using BAT, this is considered further in Section 6. We are satisfied that PAH and VOC emissions will not result in significant pollution.

(v) Summary

For the above emissions to air, for those emissions that do not screen out, we have carefully scrutinised the Applicant's proposals to ensure that they are applying the BAT to prevent and minimise emissions of these substances. This is reported in section 6 of this document. Therefore we consider the Applicant's proposals for preventing and minimising emissions to be BAT for the Installation. Dioxins and furans are considered further in section 5.3.2.

5.2.3 Assessment of Emission of Metals

The Applicant has assessed the impact of metal emissions to air, as previously described.

There are three sets of BAT AELs for metal emissions:

- An emission limit value of 0.02 mg/m^3 for mercury and its compounds (formerly WID group 1 metals).
- An aggregate emission limit value of 0.02 mg/m^3 for cadmium and thallium and their compounds (formerly WID group 2 metals).
- An aggregate emission limit of 0.3 mg/m^3 for antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium and their compounds (formerly WID group 3 metals).

In addition the UK is a Party to the Heavy Metals Protocol within the framework of the UN-ECE Convention on long-range trans-boundary air pollution. Compliance with the IED Annex VI emission limits for metals along with the Application of BAT also ensures that these requirements are met.

In section 5.2.1 above, the following emissions of metals were screened out as insignificant:

- Hg, Sb, Pb, Cu, Mn, V, Cr (II)(III)

Also in section 5.2.1, the following emissions of metals whilst not screened out as insignificant were assessed as being unlikely to give rise to significant pollution:

- Ni, As, Cd

This left emissions of Cr (VI) requiring further assessment. For all other metals, the Applicant has concluded that exceedences of the EAL for all metals are not likely to occur.

Where the BREF sets an aggregate limit, the Applicant's assessment assumes that each metal is emitted individually at the relevant aggregate emission limit value. This is something which can never actually occur in practice as it would inevitably result in a breach of the said limit, and so represents a very much worst case scenario.

For metals Cr (VI) the Applicant used representative emissions data from other municipal waste incinerators using our guidance note Please refer to "Guidance to Applicants on Impact Assessment for Group 3 Metals Stack Releases – version 4". Measurement of Chromium (VI) at the levels anticipated at the stack emission points is expected to be difficult, with the likely levels being below the level of detection by the most advanced methods. Data for Cr (VI) was based on total Cr emissions measurements and the proportion of total Cr to Cr (VI) in APC residues.

Based on the above, the following emissions of metals were screened out as insignificant when more representative data is used, both with and without the power station and incinerator operating at the same time:

- Cr (VI)

The installation has been assessed as meeting BAT for control of metal emissions to air. See section 6 of this document.

5.2.4 Consideration of Local Factors

(i) Impact on Air Quality Management Areas (AQMAs)

North West Leicestershire District Council, Erewash Borough Council and Nottingham City Council have declared 4 Air Quality Management Areas (AQMAs) with respect to Annual mean NO2 and 1-hour and annual mean NO2

These are located as follows:

- North West Leicestershire District Council - Kegworth AQMA 4 km from installation – Annual Mean NO2
- North West Leicestershire District Council - M1 AQMA 5 km from installation - Annual mean NO2 and 1-hour
- Erewash Borough Council AQMA No.2 - 4.4 km from installation - Annual mean NO2
- Nottingham City Council AQMA No.2 - 4.3 km from installation - Annual mean NO2

The Applicant's modelling predictions for the pollutants in the AQMAs are summarised in the tables below. The figures shown indicate the predicted peak ground level impact on pollutant concentrations in ambient air within the AQMAs.

The process contributions at AQMA's were screened out based on the maximum point of impact for Nitrogen Dioxide annual limits.

The tables below show the operator's modelling under Scenario A and Scenario D. Scenario A covers the Installation operating alone and Scenario D covers the worst case operation including the power station, combine cycle gas turbines and the incinerator because there will be some overlap between incinerator commissioning and operation and the decommissioning of the power station. Scenario B (incinerator and OCGT) and C (incinerator and OCGT plus site buildings) were not included because the worst case is covered by Scenario D.

Scenario A – Dispersion Modelling Results – point of maximum impact

Pollutant	Statistic	AQAL (µg/m3)	Background conc (µg/m3)	PC (µg/m3)	PC/AQAL (%)	PEC (µg/m3)	PEC/AQAL (%)
Nitrogen Dioxide	Annual Mean	40	24.6	0.23	0.58%	24.83	62%

Nitrogen Dioxide emissions screen out as insignificant (PC<1% of AQAL) at the maximum point of impact. On this basis the contribution to the AQMA's will also screen out as insignificant for Nitrogen Dioxide annual mean.

Scenario D – Dispersion Modelling Results – point of maximum impact

Pollutant	Statistic	AQAL (µg/m3)	Background conc (µg/m3)	PC (µg/m3)	PC/ AQAL (%)	PEC (µg/m3)	PEC/ AQAL (%)
Nitrogen Dioxide	Annual Mean	40	24.6	0.67	1.68%	25.27	63%

Nitrogen Dioxide emissions screen out as not significant (PEC <100% of AQAL) at the maximum point of impact. On this basis the contribution to the AQMA's will also screen out as not significant for Nitrogen Dioxide annual mean.

As Nitrogen dioxide hourly mean did not screen out at the point of maximum impact (PEC greater than 20% of the headroom), the Applicant modelled the impact within the AQMAs for which Nitrogen Dioxide hourly mean is a designated pollutant.

Scenario A

Receptor	AQS objective (µg/m3)	Background (µg/m3)	PC (µg/m3)	PC/ EAL (%)	PEC (µg/m3)	PEC/ EAL (%)
M1 AQMA1	200	49.2	3.47	1.74 %	52.67	26 %

Scenario D

Receptor Note 1	AQS objective (µg/m3)	Background (µg/m3)	PC (µg/m3)	PC/ EAL (%)	PEC (µg/m3)	PEC/ EAL (%)
M1 AQMA1	200	49.2	14.7	7.35%	63.9	32 %

The tables above show that the process contributions are all less than 10% of the AQAL, therefore the contribution within the AQMA is insignificant.

Overall, whilst all emissions cannot be screened out as insignificant, the Applicant's modelling shows that the installation is unlikely to result in a breach of the ES within the AQMA.

The Applicant is required to prevent, minimise and control emissions using the best available techniques; this is considered further in Section 6.

(ii) Proximity to power station and power station infrastructure to be decommissioned.

The installation is located on the site of the existing Ratcliffe power station. In line with UK Government policy, the existing coal-fired power station at Ratcliffe-on-Soar will be required to close by October 2025. The operator has noted that there is a potential operational overlap of around 9 months for the existing power station and the Installation. The applicant has accounted for this in combination impact by modelling different operating scenarios (A to D) to demonstrate that even during a short term overlap of operation, air emissions will not exceed air quality action levels. Once the power station is decommissioned however, there will be a significant reduction in background emissions.

5.2.5 Air emissions assessment of tonnages based on calorific value

The applicant proposed a throughput of 472,100 tonnes per annum (tpa) for a 10.0 MJ/kg calorific value (CV) with a maximum of 524,550 tpa for a 9.0 MJ/kg CV. The applicant however stated in their air quality modelling an expected general tonnage of 472,100 tonnes per annum figure and it was not clear how they had accounted for operating at the higher tonnages with wastes of a lower calorific value. We therefore requested further information in a schedule 5 notice dated 27/04/2021 asking them to show how they had taken into account the impact of an annual tonnage of 524,550 tpa in the event of lower calorific waste consumption.

In their response dated 28/06/2021, the applicant explained that the emission rates used in their air dispersion modelling were not based on the plant's actual designed emissions releases, to be conservative they were based on the higher emissions limits outlined in the Industrial Emissions Directive and BREF document BAT conclusions. The applicant will be required to comply with IED limits. They have therefore modelled on the basis of release at the IED limit even though the plant is design to achieve emissions below these limits. As the tonnages for a higher calorific value will still result in emission rates below the IED limits which were assessed in the air dispersion modelling, the projected increase in tonnage as result of a decrease in calorific value will not change the level of emissions rates modelled. The IED emissions rates remain higher than the emissions projected at the higher

tonnage, therefore a change in tonnage will not change the conclusions of the air dispersion modelling report.

The applicant also calculated the potential change in emissions if they processed 524,550 tonnes per annum. They outlined that the increase represents an 11 % increase by mass, but this does not result in a corresponding increase in flue gas volume flow rates due to the different fuel composition associated with the lower calorific value, notably lower hydrocarbon content and higher moisture content. Volumetric flow rate for the 9 MJ/kg CV case is only around 3 % higher than the 10 MJ/kg CV case. The impacts associated with the 9 MJ/kg CV case would only be a maximum of 3 % higher. In practice, the slightly higher exit velocity would improve dispersion for the 9 MJ/kg CV case which would reduce the difference in impacts between the two cases. This level of difference is significantly smaller than the difference in, for instance, concentrations arising from modelling different meteorological years and hence is within the uncertainty range for air quality modelling. A number of worst-case assumptions were made in the air quality modelling to ensure that estimated impacts were likely to be over estimates. As such the assessment for the 10 MJ/kg CV case can be regarded as sufficiently precautionary to encompass the impacts of the 9 MJ/kg CV case.

We have audited the assessment provided by the operator in their schedule 5 response against their air dispersion modelling report, taking into account the maximum of 524,550 tpa (for a 9.0 MJ/kg CV) to determine whether this could lead to a significant change in impacts. The proposed increase in annual throughput from 472,100 tonnes with a calorific value (CV) of 10MJ/kg up to 524,550 tpa with a lower CV of 9.0MJ/kg is an approximately 11% increase. This results in an approximately 6% increase in exit velocity and 3% increase in normalised flow rate based on the stack emission characteristics provided for the new EfW plant. We found in our audit that the increased velocity will lead to greater dispersion and less than 3% increase in PCs. This provides us with a reasonable degree of confidence to conclude the proposed change would result in a small increase (less than 3%) in predictions and impacts.

On the basis of the modelling report using conservative IED limits and the increase in tonnage not impacting significantly on the applicant’s previous conclusions, we agree with their response and are satisfied that the minor increase in predictions and impacts would not affect our assessment or previous conclusions.

5.3 Human health risk assessment

5.3.1 Our role in preventing harm to human health

The Environment Agency has a statutory role to protect the environment and human health from all processes and activities it regulates. We assessed the effects on human health for this application in the following ways:

i) Applying Statutory Controls

The plant will be regulated under EPR. These regulations include the requirements of relevant EU Directives, notably, the industrial emissions directive (IED), the waste framework directive (WFD), and ambient air directive (AAD).

The main conditions in an EfW permit are based on the requirements of the IED. Specific conditions have been introduced to specifically ensure compliance with the requirements of Chapter IV. The aim of the IED is to prevent or, where that is not practicable, to reduce emissions to air, water and land and prevent the generation of waste, in order to achieve a high level of protection of the environment taken as a whole. IED achieves this aim by setting operational conditions, technical requirements and emission limit values to meet the requirements set out in Articles 11 and 18 of the IED. These requirements may in some circumstances dictate tighter emission limits and controls than those set out in the BAT conclusions or Chapter IV of IED on waste incineration and co-incineration plants. The assessment of BAT for this installation is detailed in section 6 of this document.

ii) Environmental Impact Assessment

Industrial activities can give rise to odour, noise and vibration, accidents, fugitive emissions to air and water, releases to air (including the impact on Photochemical Ozone Creation Potential (POCP)), discharges to ground or groundwater, global warming potential and generation of waste. For an installation of this kind, the principal environmental effects are through emissions to air, although we also consider all of the other impacts listed. Section 5.1 and 5.2 above explain how we have approached the critical issue of assessing the likely impact of the emissions to air from the Installation on human health and the environment and any measures we are requiring to ensure a high level of protection.

iii) Expert Scientific Opinion

We take account of the views of national and international expert bodies. The gathering of evidence is a continuing process. Although gathering evidence is not our role we keep the available evidence under review. The following is a summary of some of the publications which we have considered (in no particular order).

An independent review of evidence on the health effects of municipal waste incinerators was published by **DEFRA** in 2004. It concluded that there was no convincing link between the emissions from MSW incinerators and adverse effects on public health in terms of cancer, respiratory disease or birth defects. On air quality effects, the report concluded "Waste incinerators contribute to local air pollution. This contribution, however, is usually a small proportion of existing background levels which is not detectable through environmental monitoring (for example, by comparing upwind and downwind levels of airborne pollutants or substances deposited to land). In some cases, waste incinerator facilities may make a more detectable contribution to air pollution. Because current MSW incinerators are located predominantly in urban areas, effects on air quality are likely to be so small as to be undetectable in practice."

HPA (now PHE) in 2009 stated that "The Health Protection Agency has reviewed research undertaken to examine the suggested links between emissions from municipal waste incinerators and effects on health. While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable".

In 2012 the UK Small Area Health Statistics Unit (SAHSU) at Imperial College was commissioned by Public Heath England (PHE) to carry out a study to extend the evidence base and to provide further information to the public about any potential reproductive and infant health risks from municipal waste incineration (MWIs).

A number of papers have been published by SAHSU since 2012 which show no effect on birth outcomes. One paper in the study looked at exposure to emissions from MWIs in the UK and concluded that exposure was low. Subsequent papers found no increased risk of a range of birth outcomes (including stillbirth and infant mortality) in relation to exposure to PM10 emissions and proximity to MWIs, and no association with MWIs opening on changes in risks of infant mortality or sex ratio.

The final part of the study, published on 21/06/19, found no evidence of increased risk of congenital anomalies from exposure to MWI chimney emissions, but a small potential increase in risk of congenital anomalies for children born within ten kilometres of MWIs. The paper does not demonstrate a causal effect, and it acknowledges that the observed results may well be down to not fully adjusting the study for factors such as other sources of pollution around MWIs or deprivation.

PHE have stated that 'While the conclusions of the study state that a causal effect cannot be excluded, the study does not demonstrate a causal association and makes clear that the results may well reflect incomplete control for confounding i.e. insufficiently accounting for other factors that can cause congenital anomalies, including other sources of local pollution. This possible explanation is supported by the fact no increased risk of congenital

anomalies was observed as a result of exposure to emissions from an incinerator.'

Following this study, PHE have further stated that 'PHE's position remains that modern, well run and regulated municipal waste incinerators are not a significant risk to public health, and as such our advice to you [i.e. the Environment Agency] on incinerators is unchanged.'

The **Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (CoC) issued** a statement in 2000 which said that "any potential risk of cancer due to residency (for periods in excess of 10 years) near to municipal solid waste incinerators was exceedingly low and probably not measurable by the most modern epidemiological techniques." In 2009, CoC considered six further relevant epidemiological papers that had been published since the 2000 statement, and concluded that "there is no need to change the advice given in the previous statement in 2000 but that the situation should be kept under review".

Republic of Ireland Health Research Board report stated that "It is hard to separate the influences of other sources of pollutants, and other causes of cancer and, as a result, the evidence for a link between cancer and proximity to an incinerator is not conclusive".

The **Food Safety Authority of Ireland (FSAI) (2003)** investigated possible implications on health associated with food contamination from waste incineration and concluded: "In relation to the possible impact of introduction of waste incineration in Ireland, as part of a national waste management strategy, on this currently largely satisfactory situation, the FSAI considers that such incineration facilities, if properly managed, will not contribute to dioxin levels in the food supply to any significant extent. The risks to health and sustainable development presented by the continued dependency on landfill as a method of waste disposal far outweigh any possible effects on food safety and quality."

Health Protection Scotland (2009) considered scientific studies on health effects associated with the incineration of waste particularly those published after the Defra review discussed earlier. The main conclusions of this report were: "(a) For waste incineration as a whole topic, the body of evidence for an association with (non-occupational) adverse health effects is both inconsistent and inconclusive. However, more recent work suggests, more strongly, that there may have been an association between emissions (particularly dioxins) in the past from industrial, clinical and municipal waste incinerators and some forms of cancer, before more stringent regulatory requirements were implemented. (b) For individual waste streams, the evidence for an association with (non-occupational) adverse health effects is inconclusive. (c) The magnitude of any past health effects on residential populations living near incinerators that did occur is likely to have been small. (d) Levels of airborne emissions from individual incinerators should be lower now than in the past, due to stricter legislative controls and improved technology. Hence, any risk to

the health of a local population living near an incinerator, associated with its emissions, should also now be lower."

The **US National Research Council Committee on Health Effects of Waste Incineration (NRC) (NRC 2000)** reviewed evidence as part of a wide ranging report. The Committee view of the published evidence was summarised in a key conclusion: "Few epidemiological studies have attempted to assess whether adverse health effects have actually occurred near individual incinerators, and most of them have been unable to detect any effects. The studies of which the committee is aware that did report finding health effects had shortcomings and failed to provide convincing evidence. That result is not surprising given the small populations typically available for study and the fact that such effects, if any, might occur only infrequently or take many years to appear. Also, factors such as emissions from other pollution sources and variations in human activity patterns often decrease the likelihood of determining a relationship between small contributions of pollutants from incinerators and observed health effects. Lack of evidence of such relationships might mean that adverse health effects did not occur, but it could mean that such relationships might not be detectable using available methods and sources."

The **British Society for Ecological Medicine (BSEM) published a report in 2005** on the health effects associated with incineration and concluded that "Large studies have shown higher rates of adult and childhood cancer and also birth defects around municipal waste incinerators: the results are consistent with the associations being causal. A number of smaller epidemiological studies support this interpretation and suggest that the range of illnesses produced by incinerators may be much wider. Incinerator emissions are a major source of fine particulates, of toxic metals and of more than 200 organic chemicals, including known carcinogens, mutagens, and hormone disrupters. Emissions also contain other unidentified compounds whose potential for harm is as yet unknown, as was once the case with dioxins. Abatement equipment in modern incinerators merely transfers the toxic load, notably that of dioxins and heavy metals, from airborne emissions to the fly ash. This fly ash is light, readily windborne and mostly of low particle size. It represents a considerable and poorly understood health hazard."

The BSEM report was reviewed by the HPA and they concluded that "Having considered the BSEM report the HPA maintains its position that contemporary and effectively managed and regulated waste incineration processes contribute little to the concentrations of monitored pollutants in ambient air and that the emissions from such plants have little effect on health." The BSEM report was also commented on by the consultants who produced the Defra 2004 report referred to above. They said that "It fails to consider the significance of incineration as a source of the substances of concern. It does not consider the possible significance of the dose of pollutants that could result from incinerators. It does not fairly consider the adverse effects that could be associated with alternatives to incineration. It relies on inaccurate and outdated material. In view of these shortcomings, the report's conclusions with regard to the health effects of incineration are not reliable."

A **Greenpeace** review on incineration and human health concluded that a broad range of health effects have been associated with living near to incinerators as well as with working at these installations. Such effects include cancer (among both children and adults), adverse impacts on the respiratory system, heart disease, immune system effects, increased allergies and congenital abnormalities. Some studies, particularly those on cancer, relate to old rather than modern incinerators. However, modern incinerators operating in the last few years have also been associated with adverse health effects."

The Health Protection Scotland report referred to above says that "the authors of the Greenpeace review do not explain the basis for their conclusion that there is an association between incineration and adverse effects in terms of criteria used to assess the strength of evidence. The weighting factors used to derive the assessment are not detailed. The objectivity of the conclusion cannot therefore be easily tested."

From this published body of scientific opinion, we take the view stated by the HPA that "While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable". We therefore ensure that permits contain conditions which require the installation to be well-run and regulate the installation to ensure compliance with such permit conditions.

iv) Health Risk Models

Comparing the results of air dispersion modelling as part of the Environmental Impact assessment against European and national air quality standards effectively makes a health risk assessment for those pollutants for which a standard has been derived. These air quality standards have been developed primarily in order to protect human health via known intake mechanisms, such as inhalation and ingestion. Some pollutants, such as dioxins, furans and dioxin like PCBs, have human health impacts at lower ingestion levels than lend themselves to setting an air quality standard to control against. For these pollutants, a different human health risk model is required which better reflects the level of dioxin intake.

Models are available to predict the dioxin, furan and dioxin like PCBs intake for comparison with the Tolerable Daily Intake (TDI) recommended by the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment, known as COT. These include the HHRAP model.

HHRAP has been developed by the US EPA to calculate the human body intake of a range of carcinogenic pollutants and to determine the mathematic quantitative risk in probabilistic terms. In the UK, in common with other European Countries, we consider a threshold dose below which the likelihood of an adverse effect is regarded as being very low or effectively zero.

The TDI is the amount of a substance that can be ingested daily over a lifetime without appreciable health risk. It is expressed in relation to bodyweight in order to allow for different body size, such as for children of different ages. In the UK, the COT has set a TDI for dioxins, furans and dioxin like PCB's of 2 picograms I-TEQ/Kg-body weight/day (N.B. a picogram is a millionth of a millionth (10-12) of a gram).

In addition to an assessment of risk from dioxins, furans and dioxin like PCB's, the HHRAP model enables a risk assessment from human intake of a range of heavy metals. In principle, the respective ES for these metals are protective of human health. It is not therefore necessary to model the human body intake.

COMEAP developed a methodology based on the results of time series epidemiological studies which allows calculation of the public health impact of exposure to the classical air pollutants (NO_2, SO_2 and particulates) in terms of the numbers of "deaths brought forward" and the "number of hospital admissions for respiratory disease brought forward or additional". COMEAP has issued a statement expressing some reservations about the applicability of applying its methodology to small affected areas. Those concerns generally relate to the fact that the exposure-response coefficients used in the COMEAP report derive from studies of whole urban populations where the air pollution climate may differ from that around a new industrial installation. COMEAP identified a number of factors and assumptions that would contribute to the uncertainty of the estimates. These were summarised in the Defra review as below:

- Assumption that the spatial distribution of the air pollutants considered is the same in the area under study as in those areas, usually cities or large towns, in which the studies which generated the coefficients were undertaken.
- Assumption that the temporal pattern of pollutant concentrations in the area under study is similar to that in the areas in which the studies which generated the coefficients were undertaken (i.e. urban areas).
- It should be recognised that a difference in the pattern of socio-economic conditions between the areas to be studied and the reference areas could lead to inaccuracy in the predicted level of effects.
- In the same way, a difference in the pattern of personal exposures between the areas to be studied and the reference areas will affect the accuracy of the predictions of effects.

The use of the COMEAP methodology is not generally recommended for modelling the human health impacts of individual installations. However it may have limited applicability where emissions of NO_x, SO_2 and particulates cannot be screened out as insignificant in the Environmental Impact assessment, there are high ambient background levels of these pollutants and we are advised that its use was appropriate by our public health consultees.

Our recommended approach is therefore the use of the methodology set out in our guidance for comparison for most pollutants (including metals) and dioxin intake model using the HHRAP model as described above for dioxins, furans and dioxin like PCBs. Where an alternative approach is adopted for dioxins, we check the predictions ourselves.

v) Consultations

As part of our normal procedures for the determination of a permit application, we consult with Local Authorities, Local Authority Directors of Public Health, FSA and PHE. We also consult the local communities who may raise health related issues. All issues raised by these consultations are considered in determining the application as described in Annex 4 of this document.

5.3.2 Assessment of Intake of Dioxins, Furans and Dioxin like PCBs

For dioxins, furans and dioxin like PCBs, the principal exposure route is through ingestion, usually through the food chain, and the main risk to health is through accumulation in the body over a period of time.

The human health risk assessment calculates the dose of dioxins and furans that would be received by local receptors if their food and water were sourced from the locality where the deposition of dioxins, furans and dioxin like PCBs is predicted to be the highest. This is then assessed against the Tolerable Daily Intake (TDI) levels established by the COT of 2 picograms I-TEQ / Kg bodyweight/ day.

The results of the Applicant's assessment of dioxin intake are detailed in the table below. (worst – case results for each category are shown). The results showed that the predicted daily intake of dioxins, furans and dioxin like PCBs at all receptors, resulting from emissions from the proposed facility, were significantly below the recommended TDI levels.

Receptor	adult	child
Residential	0.02	0.05
Agricultural	0.81	1.14

Calculated maximum daily intake of dioxins by local receptors resulting from the operation of the proposed facility (% of TDI)

The FSA has reported that dietary studies have shown that estimated total dietary intakes of dioxins and dioxin-like PCBs from all sources by all age groups fell by around 50% between 1997 and 2001, and are expected to continue to fall. A report in 2012 showed that Dioxin and PCB levels in food have fallen slightly since 2001. In 2001, the average daily intake by adults in the UK from diet was 0.9 pg WHO-TEQ/kg bodyweight. The additional daily intake predicted by the modelling as shown in the table above is substantially below this figure.

In 2010, FSA studied the levels of chlorinated, brominated and mixed (chlorinated-brominated) dioxins and dioxin-like PCBs in fish, shellfish, meat and eggs consumed in UK. It asked COT to consider the results and to advise on whether the measured levels of these PXDDs, PXDFs and PXBs indicated a health concern ('X' means a halogen). COT issued a statement in December 2010 and concluded that " The major contribution to the total dioxin toxic activity in the foods measured came from chlorinated compounds. Brominated compounds made a much smaller contribution, and mixed halogenated compounds contributed even less (1% or less of TDI). Measured levels of PXDDs, PXDFs and dioxin-like PXBs do not indicate a health concern". COT recognised the lack of quantified TEFs for these compounds but said that "even if the TEFs for PXDDs, PXDFs and dioxin-like PXBs were up to four fold higher than assumed, their contribution to the total TEQ in the diet would still be small. Thus, further research on PXDDs, PXDFs and dioxin-like PXBs is not considered a priority."

In the light of this statement, we assess the impact of chlorinated compounds as representing the impact of all chlorinated, brominated and mixed dioxins / furans and dioxin like PCBs.

5.3.3 Particulates smaller than 2.5 microns

The Operator will be required to monitor particulate emissions using the method set out in Table S3.1 of Schedule 3 of the Permit. This method requires that the filter efficiency must be at least 99.5 % on a test aerosol with a mean particle diameter of 0.3 µm, at the maximum flow rate anticipated. The filter efficiency for larger particles will be at least as high as this. This means that particulate monitoring data effectively captures everything above 0.3 µm and much of what is smaller. It is not expected that particles smaller than 0.3 µm will contribute significantly to the mass release rate / concentration of particulates because of their very small mass, even if present. This means that emissions monitoring data can be relied upon to measure the true mass emission rate of particulates.

Nano-particles are considered to refer to those particulates less than 0.1 µm in diameter ($PM_{0.1}$). Questions are often raised about the effect of nano-particles on human health, in particular on children's health, because of their high surface to volume ratio, making them more reactive, and their very small size, giving them the potential to penetrate cell walls of living organisms. The small size also means there will be a larger number of small particles for a given mass concentration. However the HPA statement (referenced below) says that due to the small effects of incinerators on local concentration of particles, it is highly unlikely that there will be detectable effects of any particular incinerator on local infant mortality.

The HPA (now PHE) addresses the issue of the health effects of particulates in their September 2009 statement 'The Impact on Health of Emissions to Air from Municipal Incinerators'. It refers to the coefficients linking PM_{10} and $PM_{2.5}$ with effects on health derived by COMEAP and goes on to say that if

these coefficients are applied to small increases in concentrations produced, locally, by incinerators; the estimated effects on health are likely to be small. PHE note that the coefficients that allow the use of number concentrations in impact calculations have not yet been defined because the national experts have not judged that the evidence is sufficient to do so. This is an area being kept under review by COMEAP.

In December 2010, COMEAP published a report on The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom. It says that "a policy which aims to reduce the annual average concentration of $PM_{2.5}$ by 1 $\mu g/m^3$ would result in an increase in life expectancy of 20 days for people born in 2008." However, "The Committee stresses the need for careful interpretation of these metrics to avoid incorrect inferences being drawn – they are valid representations of population aggregate or average effects, but they can be misleading when interpreted as reflecting the experience of individuals."

PHE also point out that in 2007 incinerators contributed 0.02% to ambient ground level PM_{10} levels compared with 18% for road traffic and 22% for industry in general. PHE noted that in a sample collected in a day at a typical urban area the proportion of $PM_{0.1}$ is around 5-10% of PM_{10}. It goes on to say that PM_{10} includes and exceeds $PM_{2.5}$ which in turn includes and exceeds $PM_{0.1}$. The National Atmospheric Emissions Inventory (NAEI) figures show that in 2016 municipal waste incineration contributed 0.03% to ambient ground level PM_{10} levels and 0.05% to ambient ground level PM2.5 levels. The 2016 data also shows that road traffic contributed to 5.35% of PM10 and 4.96% of PM2.5 and that domestic wood burning contributed 22.4% to PM10 and 34.3% of PM2.5 levels.

This is consistent with the assessment of this application which shows emissions of PM_{10} to air to be insignificant.
A 2016 a paper by Jones and Harrison concluded that 'ultrafine particles (<100nm) in flue gases from incinerators are broadly similar to those in urban air and that after dispersion with ambient air ultrafine particle concentrations are typically indistinguishable from those that would occur in the absence of the incinerator.

We take the view, based on the foregoing evidence, that techniques which control the release of particulates to levels which will not cause harm to human health will also control the release of fine particulate matter to a level which will not cause harm to human health.

5.3.4 Assessment of Health Effects from the Installation

We have assessed the health effects from the operation of this installation in relation to the above (sections 5.3.1 to 5.3.3). We have applied the relevant requirements of the national and European legislation in imposing the permit conditions. We are satisfied that compliance with these conditions will ensure protection of the environment and human health.

Taking into account all of the expert opinion available, we agree with the conclusion reached by PHE that "While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable."

In carrying out air dispersion modelling as part of the Environmental Impact assessment and comparing the predicted environmental concentrations with European and national air quality standards, the Applicant has effectively made a health risk assessment for many pollutants. These air quality standards have been developed primarily in order to protect human health.

The Applicant's assessment of the impact from PM10 and PM2.5, HF, HCl, CO, PAH, NH_3, PCBs, Hg, Sb, Cu, V, Cr(II), Cr(III) have all indicated that the Installation emissions screen out as insignificant; where the impact of emissions of NO_2, SO_2, TOC, Cd, Pb, Mn, Ni, As have not been screened out as insignificant, the assessment still shows that the predicted environmental concentrations are well within air quality standards or environmental action levels.

Cr (VI) did not screen out and therefore were considered in further detail.
Using representative emissions data from other municipal waste incinerators using our guidance note Please refer to "Guidance to Applicants on Impact Assessment for Group 3 Metals Stack Releases – version 4" The results show that the process contribution when using the maximum, mean and minimum emission concentrations from the EA guidance are all below 1 % of the AQAL and, therefore, can be classed as insignificant. See section 5.2.3

The Environment Agency has reviewed the methodology employed by the Applicant to carry out the health impact assessment.

Contributions from the proposed facility are unlikely to exceed any Environmental Standard set for the protection of human health from both regular and abnormal operations. Predicted risks as a consequence of dioxins and furans emissions are well within the screening criteria for the protection of human health. Contributions at the AQMA are not significant.

Overall, taking into account the conservative nature of the impact assessment (i.e. that it is based upon an individual exposed for a lifetime to the effects of the highest predicted relevant airborne concentrations and consuming mostly locally grown food), it was concluded that the operation of the proposed

facility will not pose a significant carcinogenic or non-carcinogenic risk to human health.

Public Health England and the Local Authority Director of Public Health were consulted on the Application and concluded that they had no significant concerns regarding the risk to the health of humans from the installation. The Food Standards Agency was also consulted during the permit determination process and it concluded that it is unlikely that there will be any unacceptable effects on the human food chain as a result of the operations at the Installation. Details of the responses provided to the consultation on this Application can be found in Annex 4.

The Environment Agency is therefore satisfied that the Applicant's conclusions presented above are soundly based and we conclude that the potential emissions of pollutants including dioxins, furans and metals from the proposed facility are unlikely to have an impact upon human health.

5.4 Impact on Habitats sites, SSSIs, non-statutory conservation sites etc.

5.4.1 Sites Considered

There are no Habitats (i.e. Special Areas of Conservation, Special Protection Areas and Ramsar) sites within 10 km of the proposed Installation.

The following Sites of Special Scientific Interest are located within 2 km of the Installation:

- Lockington Marches (SSSI)

The following non-statutory local wildlife and conservation sites are located within 2 km of the Installation:

- Attenborough West Gravel Pits
- Copse Kingston-on-Soar
- Cranfleet Farm Floodbanks
- Cranfleet Ponds (West Pond)
- Erewash Canal
- Gotham Hill Woods
- Gotham Wood
- Lockington Ash
- Lockington Ash 2
- Lockington Confluence Backwater
- Lockington Confluence Hedges
- Lockington Fen
- Lockington Grounds, pond and marsh near Trent
- Lockington Trentside Pools
- Lockington swamp by SSSI
- Lower Soar Floodplain Wetland
- Meadow Lane Carr
- Narrow Bridge Fish Pond
- Pond in hedgeline between two improved grasslands
- Poplars Fish Pond
- Rare Plant Register Mousetail Pasture
- Ratcliffe Lane Pasture and Stream
- Ratcliffe-on-Soar Flyash Grassland1
- Ratcliffe-on-Soar Flyash Grassland2
- Ratcliffe-on-Soar Flyash Track Grassland
- Ratcliffe-on-Soar Pond
- Red Hill Ratcliffe on Soar
- Redhill Marina Backwater
- River Soar Loughborough Meadows to Trent
- River Soar West Bank south of A453
- River Trent North Bank
- Shooting Ground Marsh Grassland, Lockington
- Sheetstores Junction Pond
- Soar Meadow near Ratcliffe Lock
- South Junction Pond

- Thrumpton Bank
- Thrumpton Park
- Trent Floodplain Wetland - Lock M07
- Trent Floodplain Wetland Lock M13
- Trent Lock Marsh
- River Trent

5.4.2 SSSI Assessment

The Applicant's assessment of SSSIs was reviewed by the Environment Agency's technical specialists for modelling, air quality, conservation and ecology technical services, who agreed with the assessment's conclusions, that the proposal does not damage the special features of the SSSI.

The operator modelled scenarios A, B, C and D. The table below shows the operators modelling Scenario D which covers a worst case operation including the power station, combine cycle gas turbines and the incinerator because there will be some overlap between incinerator commissioning and operation and the decommissioning of the power station.

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % ES
Direct Impacts[2]						
NO_x Annual	30	23.41	0.464	1.5 %	23.87	79.6 %
NO_x Daily Mean	75	46.82	20.9	27.9 %	67.7	90.3 %
SO2	10 (1)	1.56	0.236	2.4 %	1.80	18.0 %
Ammonia	1 (1)	2.17	0.018	1.8 %	2.18	218 %
HF Weekly Mean	0.5	0.048	0.098	19.5 %	0.15	29.1 %
HF Daily Mean	5	-	0.419	8.4 %	-	-
Deposition Impacts[2]						
N Deposition (kg N/ha/yr)	10	33.88	0.271	2.7 %	34.15	342 %
Acidification (Keq/ha/yr)	1.764	2.18	0.114	6.5 %	2.29	130 %

(1) The lichen and bryophyte sensitivity standards for ammonia and sulphur dioxide have been assigned for this assessment as the potential presence of these features has been recorded in the site Management Plan for at least one of the sections of the site.

(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

The table below shows the operators modelling Scenario A which covers the incinerator plant in isolation because the aim of the site's development is to decommission the power station and redevelop the site.

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % ES
Direct Impacts[2]						
NO_x Annual	30	-	0.164	0.5 %	-	-
NO_x Daily Mean	75	-	3.44	4.6 %	-	-
SO2	10 (1)	-	0.040	0.4 %	-	-
Ammonia	1 (1)	2.17	0.014	1.4 %	2.19	219 %
HF Weekly Mean	0.5	-	0.013	2.5 %	-	-
HF Daily Mean	5	-	0.027	0.5 %	-	-
Deposition Impacts[2]						
N Deposition (kg N/ha/yr)	10	33.88	0.154	1.5 %	34.03	340 %
Acidification (Keq/ha/yr)	1.764	2.18	0.032	1.8 %	2.21	125 %

(1) The lichen and bryophyte sensitivity standards for ammonia and sulphur dioxide have been assigned for this assessment as the potential presence of these features has been recorded in the site Management Plan for at least one of the sections of the site.

(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

Conclusions of the assessment

The results showed that impacts at Lockington Marshes are all insignificant with the exception of ammonia, nitrogen deposition and acid deposition which are above the 1% insignificant screening level. Given that ammonia, nitrogen deposition and acid deposition are marginally above 1% based on a worse case (which includes the power station which is to be decommissioned) and the predicted environment concentrations are dominated by background levels we reviewed the potential for impact on the features of the SSSI.

On review of the protected features of the site it was determine that fen, marsh and swamp features are not classified as sensitive to the potential

emissions and W6 Alnus glutinosa-Urtica dioica woodland is found on wet, nutrient-rich soils which are not sensitive to acid or nitrogen deposition in practice because they occupy naturally nutrient-rich habitats. In addition alder trees support nitrogen-fixing bacteria, resulting in high levels of nitrogen in the soil. Based on this we concluded that the Installation would not damage the features of the SSSI.

In conclusion, although there was an exceedance on review of the protected site, taking into account the only marginal exceedance and that the features of the site are not considered sensitive to those emissions which are not insignificant we concluded that the Installation would not damage the SSSI.

Natural England were consulted on the proposals and the potential for impact and they agreed with our assessment

5.4.4 Assessment of other conservation sites

Conservation sites are protected in law by legislation. The Habitats Directive provides the highest level of protection for SACs and SPAs, domestic legislation provides a lower but important level of protection for SSSIs. Finally the Environment Act provides more generalised protection for flora and fauna rather than for specifically named conservation designations. It is under the Environment Act that we assess other sites (such as local wildlife sites) which prevents us from permitting something that will result in significant pollution; and which offers levels of protection proportionate with other European and national legislation. However, it should not be assumed that because levels of protection are less stringent for these other sites, that they are not of considerable importance. Local sites link and support EU and national nature conservation sites together and hence help to maintain the UK's biodiversity resilience.

For SACs SPAs, Ramsars and SSSIs we consider the contribution PC and the background levels in making an assessment of impact. In assessing these other sites under the Environment Act we look at the impact from the Installation alone in order to determine whether it would cause significant pollution. This is a proportionate approach, in line with the levels of protection offered by the conservation legislation to protect these other sites (which are generally more numerous than Natura 2000 or SSSIs) whilst ensuring that we do not restrict development.

Critical levels and loads are set to protect the most vulnerable habitat types. Thresholds change in accordance with the levels of protection afforded by the legislation. Therefore the thresholds for SAC SPA and SSSI features are more stringent than those for other nature conservation sites.

Therefore we would generally conclude that the Installation is not causing significant pollution at these other sites if the PC is less than the relevant critical level or critical load, provided that the Applicant is using BAT to control emissions.

Impact based on most impacted non statutory site Gotham Hill Woods.

Scenario D

Pollutant	ES (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES
NO_x Annual	30	0.943	3.1
NO_x Daily Mean	75	23.21	30.9
SO2	10	0.543	5.4
Ammonia	1	0.035	3.5
HF Weekly Mean	0.5	0.147	29.3
HF Daily Mean	5	0.545	10.9
N Deposition (kg N/ha/yr)	10	0.535	5.4
Acidification (Keq/ha/yr)	10.973	0.187	1.7

Scenario A

Pollutant	ES (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES
NO_x Annual	30	0.319	1.1
NO_x Daily Mean	75	3.25	4.3
SO2	10	0.078	0.8
Ammonia	1	0.027	2.7
HF Weekly Mean	0.5	0.012	2.4
HF Daily Mean	5	0.026	0.5
N Deposition (kg N/ha/yr)	10	0.299	3.0
Acidification (Keq/ha/yr)	10.973	0.062	0.6

The tables above show that the PCs are below the critical levels or loads. We are satisfied that the Installation will not cause significant pollution at the sites. The Applicant is required to prevent, minimise and control emissions using BAT, this is considered further in Section 6.

5.5 Impact of abnormal operations

Article 50(4)(c) of IED requires that waste incineration and co-incineration plants shall operate an automatic system to prevent waste feed whenever any of the continuous emission monitors show that an emission limit value (ELV) is exceeded due to disturbances or failures of the purification devices. Notwithstanding this, Article 46(6) allows for the continued incineration and co-incineration of waste under such conditions provided that this period does not (in any circumstances) exceed 4 hours uninterrupted continuous operation or the cumulative period of operation does not exceed 60 hours in a calendar year. This is a recognition that the emissions during transient states (e.g. start-up and shut-down) are higher than during steady-state operation, and the overall environmental impact of continued operation with a limited exceedance of an ELV may be less than that of a partial shut-down and re-start.

For incineration plant, IED sets backstop limits for particulates, CO and TOC which must continue to be met at all times. The CO and TOC limits are the same as for normal operation, and are intended to ensure that good combustion conditions are maintained. The backstop limit for particulates is 150 mg/m^3 (as a half hourly average) which is five times the limit in normal operation.

Article 45(1)(f) requires that the permit shall specify the maximum permissible period of any technically unavoidable stoppages, disturbances, or failures of the purification devices or the measurement devices, during which the concentrations in the discharges into the air may exceed the prescribed emission limit values. In this case we have decided to set the time limit at 4 hours, which is the maximum period prescribed by Article 46(6) of the IED.

These abnormal operations are limited to no more than a period of 4 hours continuous operation and no more than 60 hour aggregated operation in any calendar year. This is less than 1% of total operating hours and so abnormal operating conditions are not expected to have any significant long term environmental impact unless the background conditions were already close to, or exceeding, an ES. For the most part the consideration of abnormal operations is limited to consideration of its impact on short term ESs.

In making an assessment of abnormal operations the following worst case scenario has been assumed:

- Dioxin emissions of 6 ng/m^3 (100 x normal)
- Mercury emissions are 100 times those of normal operation
- NO_x emissions of 400 mg/m^3
- Particulate emissions of 150 mg/m^3 (5 x normal)

- Metal emissions other than mercury are 30 times those of normal operation
- SO_2 emissions of 500 mg/m^3 (2.5 x normal)
- HCl emissions of 1200 mg/m^3 (20x normal)
- PCBs (100 x normal)

This is a worst case scenario in that these abnormal conditions include a number of different equipment failures not all of which will necessarily result in an adverse impact on the environment (e.g. a failure of a monitoring instrument does not necessarily mean that the incinerator or abatement plant is malfunctioning). This analysis assumes that any failure of any equipment results in all the negative impacts set out above occurring simultaneously.

The result on the Applicant's short-term environmental impact is summarised in the table below.

Pollutant	**EQS / EAL**		**Back-ground**	**Process Contribution (PC)**		**Predicted Environmental Concentration (PEC)**	
	µg/m³		**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
NO_2	200	99.79th %ile of 1-hour means	49.2	11.5	5.8	60.7	30.4
PM_{10}	50	90.41st %ile of 24-hour means	37.4	0.48	0.96	37.88	75.8
SO_2	266	99.9th ile of 15-min means	4.8	54.3	20.4	59.1	22.2
	350	99.9th ile of 15-min means	4.8	37.5	10.71	42.3	12.1
	125	99.18th %ile of 24-hour means	4.8	7.88	6.30	12.68	10.1
HCl	750	1-hr average	0.84	170.4	22.72	171.2	22.83

HF	160	1-hr average	4.7	1.14	0.7125	5.84	3.7
Hg	7.5	1-hr average	0.038	0.25	3.3	0.29	4
Sb	150	1-hr average	0.003	4.5	3	4.50300	3
Cu	200	1-hr average	0.016	4.5	2.25	4.51600	2
Mn	1500	1-hr average	0.22	4.5	0.3	4.72000	0.3
PCBs	6	1-hr average		1.2E-06	2E05		
Cr (II)(III)	150	1-hr average	0.03	4.5	3	4.53000	3

From the table above the emissions of the following substances can still be considered insignificant, in that the PC is <10% of the short-term ES.

- NO_2
- PM_{10}
- SO_2 - 99.18th %ile of 24-hour means
- *HF*
- *Hg*
- *Sb*
- *Cu*
- *Mn*
- *PCB*
- *Cr (II) (III)*

Also from the table above emissions of the following emissions (which were not screened out as insignificant) have been assessed as being unlikely to give rise to significant pollution in that the predicted environmental concentration is less than 100% of short term ES.

- SO_2
- HCl

We are therefore satisfied that it is not necessary to further constrain the conditions and duration of the periods of abnormal operation beyond those permitted under Chapter IV of the IED.

We have not assessed the impact of abnormal operations against long term ESs for the reasons set out above. Except that if dioxin emissions were at 10 ng/m^3 for the maximum period of abnormal operation, this would result in an increase of approximately 70% in the TDI reported in section 5.3.2 In these circumstances the TDI would be ~ 1.91% of the COT TDI. At this level, emissions of dioxins will still not pose a risk to human health.

5.6 Impact of emissions during OTNOC

IED article 14 (3) states that BAT conclusions shall be the reference for setting the permit conditions. Article 14 (3) states that the competent authority shall set emission limit values that, under normal operating conditions, do not exceed the emission levels associated with the best available techniques as laid down in the decisions on BAT conclusions.

These limits are set in Table S3.1. In addition, the IED also sets maximum limits for certain emissions that should not be exceeded and would still apply outside normal operating conditions. These limits are set in Tale S3.1(b) and are normally higher that the BAT AELs

The IED and BAT conclusions therefore make provision for plants to have short term fluctuations where BAT AELs could be exceeded but the IED limits are not other than under abnormal operation. These periods are called 'Other than normal operation.' (OTNOC). Although the BAT AELs can be exceeded during OTNOC setting BAT AELs as emission limits is controlling emissions because plants will need to ensure that the plant is capable of meeting the BAT AELs during normal operation which will apply for most of the time the plant is operational.

Although BAT AELs do not apply during periods of OTNOC the IED annex VI emission limits do still apply.

Periods of OTNOC will be of short duration and limited in nature. The Applicant used the IED annex VI half hour average limits to assess short term impacts, therefore no further specific assessment of the impacts during OTNOC was required.

Pre-operational condition PO1 requires the Operator to have an EMS and that the EMS will include an OTNOC management plan in line with BAT conclusions 1 and 18. The Operator will be required to identify potential OTNOC scenarios and any required monitoring in their management plan and will require our approval of scenarios before they can be classed as OTNOC.

We may impose further monitoring and limits, through table S3.1(b) of the Permit, once we have approved the OTNOC scenarios.

5.7 Other Emissions

There will be no emissions to sewer, all foul water and process emissions will be collected in a dirty water pit or septic tank and transported offsite for treatment via a third party.

6. Application of Best Available Techniques

6.1 Scope of Consideration

In this section, we explain how we have determined whether the Applicant's proposals are the Best Available Techniques for this Installation.

- The first issue we address is the fundamental choice of incineration technology. There are a number of alternatives, and the Applicant has explained why it has chosen one particular kind for this Installation.

- We then consider in particular control measures for the emissions which were not screened out as insignificant in the previous section on minimising the installation's environmental impact. They are: NO_2, SO_2, HCL, N dep, acid dep, NH_3, TOC and some metals.

- We also have to consider the combustion efficiency and energy utilisation of different design options for the Installation, which are relevant considerations in the determination of BAT for the Installation, including the Global Warming Potential of the different options.

- Finally, the prevention and minimisation of Persistent Organic Pollutants (POPs) must be considered, as we explain below.

Chapter IV of the IED specifies a set of maximum emission limit values. Although these limits are designed to be stringent, and to provide a high level of environmental protection, they do not necessarily reflect what can be achieved by new plant. Article 14(3) of the IED says that BAT Conclusions shall be the reference for setting the permit conditions, so it may be possible and desirable to achieve emissions below the limits referenced in Chapter IV. The BAT conclusions were published on 12 November 2019.

Even if the Chapter IV limits are appropriate, operational controls complement the emission limits and should generally result in emissions below the maximum allowed; whilst the limits themselves provide headroom to allow for unavoidable process fluctuations. Actual emissions are therefore almost certain to be below emission limits in practice, because any Operator who sought to operate its installation continually at the maximum permitted level would almost inevitably breach those limits regularly, simply by virtue of normal fluctuations in plant performance, resulting in enforcement action

(including potentially prosecution) being taken. Assessments based on, say, Chapter IV limits are therefore “worst-case” scenarios.

Should the Installation, once in operation, emit at rates significantly below the limits included in the Permit, we will consider tightening ELVs appropriately. We are, however, satisfied that emissions at the permitted limits would ensure a high level of protection for human health and the environment in any event.

6.1.1 Consideration of Furnace Type

The prime function of the furnace is to achieve maximum combustion of the waste. Chapter IV of the IED requires that the plant (furnace in this context) should be designed to deliver its requirements. The main requirements of Chapter IV in relation to the choice of a furnace are compliance with air emission limits for CO and TOC and achieving a low TOC/LOI level in the bottom ash.

The BREF states that Municipal Waste can be incinerated in traveling grates, rotary kilns and fluidised bed technology. Fluidised bed technology requires MSW to be of a certain particle size range, which usually requires some degree of pre-treatment even when the waste is collected separately.
The BREF describes other process such as gasification and pyrolysis. The BREF notes that some of the processes have encountered technical and economic problems when scaled up to commercial, industrial sizes. Some are used on a commercial basis in Japan and are being tested in demonstration plants in Europe but still only have a small share of overall capacity.

Section 4.3 of the BREF provides a comparison of combustion and thermal treatment technologies, used in Europe and factors affecting their applicability and operational suitability for various waste types. There is also some information on the comparative costs. The table below has been extracted from the BREF tables. This table is also in line with the Guidance Note “The Incineration of Waste (EPR 5.01). However, it should not be taken as an exhaustive list nor that all technologies listed have found equal application across Europe.

Overall, any of the furnace technologies listed below would be considered as BAT provided the Applicant has justified it in terms of:

- nature/physical state of the waste and its variability
- proposed plant throughput which may affect the number of incineration lines
- preference and experience of chosen technology including plant availability
- nature and quantity/quality of residues produced.
- emissions to air – usually NOx as the furnace choice could have an effect on the amount of unabated NOx produced
- energy consumption – whole plant, waste preparation, effect on GWP
- Need, if any, for further processing of residues to comply with TOC
- Costs

Summary comparison of thermal treatment technologies (reproduced from the Waste Incineration BREF)

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Moving grate (air-cooled)	• Low to medium heat values (LCV 5 – 16.5 GJ/t) • Municipal and other • heterogeneous solid wastes • Can accept a proportion of sewage sludge and/or medical waste with municipal waste • Applied at most modern • MSW installations	• 1 to 50 t/h with most projects 5 to 30 t/h. • Most industrial applications not below 2.5 or 3 t/h.	• Widely proven at large scales. • Robust • Low maintenance cost • Long operational history • Can take heterogeneous wastes without special • preparation	• Generally not suited to powders, liquids or materials that melt through the grate	TOC 0.5% to 3%	High capacity reduces specific cost per tonne of waste
Moving grate (liquid Cooled)	Same as air-cooled grates except: LCV 10 – 20 GJ/t	Same as air-cooled grates	As air-cooled grates but: • higher heat value waste is treatable • Better combustion control possible.	As air-cooled grates but: • risk of grate damage/ leaks • higher complexity	TOC 0.5% to 3%	Slightly higher capital cost than air-cooled
Rotary Kiln	Can accept liquids and pastes as well as gases Solid feeds more limited than grate (due to refractory damage) often applied to hazardous Wastes	<16 t/h	• Very well proven • Broad range of wastes • Good burn out even of HW	Throughputs lower than grates	TOC <3 %	Higher specific cost due to reduced capacity

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Fluid bed - bubbling	• Wide range of CV (5-25 MJ/kg) • Only finely divided • consistent wastes. • Limited use for raw MSW • Often applied to sludges co fired with RDF, shredded MSW, sludges, poultry manure	Up to 25 t/h	• Good mixing • Fly ashes of good leaching quality	• Careful operation required to avoid clogging bed. • Higher fly ash quantities.	TOC <1%	FGT cost may be lower. Costs of waste preparation
Fluid bed - circulating	• Wide range of CV (6-25 MJ/kg) • Only finely divided consistent wastes. • Limited use for raw MSW • Often applied to sludges co-fired with RDF, coal, wood waste	Up 70 70 t/h	• Good mixing • High steam parameters up to 500oC • Greater fuel flexibility than BFB • Fly ashes of good leaching quality	• Cyclone required to conserve bed material • Higher fly ash quantities	TOC <1%	• FGT cost may be lower. • Costs of waste preparation
Spreader - stoker combustor	• RDF and other particle feeds • Poultry manure • Wood wastes	No information	• Simple grate construction • Less sensitive to particle size than FB	Only for well defined mono-streams	No information	No information

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Gasification - fixed bed	• Mixed plastic wastes • Other similar consistent streams • Gasification less widely used/proven than incineration	Up to 20 t/h	• Low leaching residue • Good burnout if oxygen blown • Syngas available • Reduced oxidation of recyclable metals	• Limited waste feed • Not full combustion • High skill level • Tar in raw gas • Less widely proven	• Low leaching bottom ash • Good burnout with oxygen	High operating/ maintenance costs
Gasification - entrained flow	• Mixed plastic wastes • Other similar consistent streams • Not suited to untreated MSW • Gasification less widely used/proven than incineration	Up to 10 t/h	• Low leaching slag • Reduced oxidation of recyclable metals	• Limited waste feed • Not full combustion • High skill level • Less widely proven	low leaching slag	• High operation/ maintenance costs • High pre-treatment costs
Gasification - fluidised bed	• Mixed plastic wastes • Shredded MSW • Shredder residues • Sludges • Metal rich wastes • Other similar consistent streams • Gasification less widely used/proven than incineration	5 – 20 t/h	• Can use low reactor temperatures e.g. for Al recovery • Separation of main non combustibles • Can be combined with ash melting • Reduced oxidation of recyclable metals	• Limited waste size (<30cm) • Tar in raw gas • Higher UHV raw gas • Less widely proven	If combined with ash melting chamber ash is vitrified	Lower than other gasifiers

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Pyrolysis	• Pre-treated MSW • High metal inert streams • Shredder residues/plastics • Pyrolysis is less widely used/proven than incineration	~ 5 t/h (short drum) 5 – 10 t/h (medium drum)	• No oxidation of metals • No combustion energy for metals/inert • In reactor acid neutralisation possible • Syngas available	• Limited wastes • Process control and engineering critical • High skill level • Not widely proven • Need market for syngas	• Dependent on process temperature • Residue produced requires further processing and sometimes combustion	High pre-treatment, operation and capital costs

The Applicant has carried out a review of the following candidate furnace types:

- Moving Grate Furnace
- Rotary Kiln
- Fluidised Bed
- Pyrolysis / Gasification

The Applicant concluded that a moving grate furnace was BAT, the reasons for their assessment is summarised below:

- Moving grate
  - Proven at this scale and already widely adopted across Europe.
  - Wide fuel flexibility, allowing mixed quality wastes to be delivered directly without pre-treatment.
  - Low maintenance, high proven availability.
  - Ash residue mainly removed as low risk incinerator bottom ash (IBA).
  - Several technology providers are available, so costs are controlled/competitive
  - Lower global warming potential than fluidised bed

- Rotary kilns
  - Only proven at small scale. Multiple units would be required to deliver the required waste consumption at the EMERGE Centre.
  - Efficiency is lower than other options.
  - Higher combustion temperatures and excess air give higher NOx levels.
  - Reliability issues, particularly related to seal air ingress.

- Fluidised bed furnaces
  - Requires small fuel particle size, therefore requires waste pre-treatment.
  - Higher Capex and Opex than other options.

- Pyrolysis/ gasification
  - Requires tight fuel quality control, therefore requires pre-treatment and blending if mixed quality wastes are used.
  - Technology has shown poor reliability and is regarded as high risk.
  - Syngas clean-up can be difficult and expensive.

The Applicant has proposed to use a furnace technology comprising a moving grate furnace which is identified in the tables above as being considered BAT in the BREF or TGN for this type of waste feed.

The Applicant proposes to use gas oil as support fuel for start-up, shut down and for the auxiliary burners. The choice of support fuel is based on the storage of LPG requiring specialist pressure vessels and presenting an explosion risk. The proximity of the A453 carriageway precludes the use of LPG due to explosion risk. When firing using natural gas, large volumes of gas are required, this would have to be supplied from a high-pressure gas main in close proximity to the Installation. There is not a high-pressure gas main within the Installation boundary or near to the site. Therefore, natural gas is not a suitable auxiliary fuel. A fuel oil tank can be easily installed at the site. Storage of low sulphur fuel oil does not present the same safety risks as LPG. The combustion of fuel oil will lead to emissions of sulphur dioxide, but these emissions will be minimised as far as reasonably practicable through the use of low sulphur gas oil.

Boiler Design

In accordance with BAT 30 of the BAT C and our Technical Guidance Note, EPR 5.01, the Applicant has confirmed that the boiler design will include the following features to minimise the potential for reformation of dioxins within the de-novo synthesis range:

- ensuring that the steam/metal heat transfer surface temperature is a minimum where the exhaust gases are within the de-novo synthesis range;
- design of the boilers using CFD to ensure no pockets of stagnant or low velocity gas;
- boiler passes are progressively decreased in volume so that the gas velocity increases through the boiler; and
- Design of boiler surfaces to prevent boundary layers of slow moving gas.

Any of the options listed in the BREF and summarised in the table above can be BAT. The Applicant has chosen a furnace technique that is listed in the BREF and we are satisfied that the Applicant has provided sufficient justification to show that their technique is BAT. This is not to say that the other techniques could not also be BAT, but that the Applicant has shown that their chosen technique is at least comparable with the other BAT options. We believe that, based on the information gathered by the BREF process, the chosen technology will achieve the requirements of Chapter IV of the IED for the air emission of TOC/CO and the TOC on bottom ash.

6.2 BAT and emissions control

The prime function of flue gas treatment is to reduce the concentration of pollutants in the exhaust gas as far as practicable. The techniques which are described as BAT individually are targeted to remove specific pollutants, but the BREF notes that there is benefit from considering the Flue Gas Cleaning System (FGC) system as a whole unit. Individual units often interact, providing a primary abatement for some pollutants and an additional effect on others.

The BREF lists the general factors requiring consideration when selecting flue-gas treatment (FGC) systems as:

- type of waste, its composition and variation
- type of combustion process, and its size
- flue-gas flow and temperature
- flue-gas content, including magnitude and rate of composition fluctuations
- target emission limit values
- restrictions on discharge of aqueous effluents
- plume visibility requirements
- land and space availability
- availability and cost of outlets for residues accumulated/recovered
- compatibility with any existing process components (existing plants)
- availability and cost of water and other reagents
- energy supply possibilities (e.g. supply of heat from condensing scrubbers)
- reduction of emissions by primary methods
- noise
- arrangement of different flue-gas cleaning devices if possible with decreasing flue-gas temperatures from boiler to stack

Taking these factors into account the Technical Guidance Note points to a range of technologies being BAT subject to circumstances of the Installation.

6.2.1 Particulate Matter

Particulate matter				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Bag / Fabric filters (BF)	Reliable abatement of particulate matter to below 5mg/m^3	Max temp 250°C Higher energy use than ESP Sensitive to condensation and corrosion	Multiple compartments Bag burst detectors	Most plants
Wet scrubbing	May reduce acid gases simultaneously.	Not normally BAT. Liquid effluent produced	Require reheat to prevent visible plume and dew point problems.	Where scrubbing required for other pollutants

Ceramic filters	High temperature applications Smaller plant.	May "blind" more than fabric filters		Small plant. High temperature gas cleaning required.
Electrostatic precipitators (ESP)	Low pressure gradient. Use with BF may reduce the energy consumption of the induced draft fan.	Not normally BAT by itself Risk of dioxin formation if used in 200-400^{o}C range		When used with other particulate abatement plant

The Applicant proposes to use fabric filters for the abatement of particulate matter. Fabric filters provide reliable abatement of particulate matter to below 5 mg/m^3 and are BAT for most installations. The Applicant proposes to use multiple compartment filters with burst bag detection to minimise the risk of increased particulate emissions in the event of bag rupture.

Emissions of particulate matter have been previously screened out as insignificant, and so the Environment Agency agrees that the Applicant's proposed technique is BAT for the installation.

6.2.2 Oxides of Nitrogen

Oxides of Nitrogen : Primary Measures				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Low NOx burners	Reduces NOx at source		Start-up, supplementary firing.	Where auxiliary burners required.
Starved air systems	Reduce CO simultaneously.			Pyrolysis, Gasification systems.
Optimise primary and secondary air injection				All plant.
Flue Gas Recirculation (FGR)	Reduces the consumption of reagents used for secondary NOx control. May increase overall energy recovery	Some applications experience corrosion problems. Can result in elevated CO and other products of incomplete combustion		Justify if not used

Oxides of Nitrogen : Secondary Measures (BAT is to apply Primary Measures first)				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Selective catalytic reduction (SCR)	NOx emissions 40-150mg/ m^3 Reduces CO, VOC, dioxins	Expensive. Re-heat required – reduces plant efficiency		All plant
SCR by catalytic filter bags	50-120 mg/m^3			Applicable to new and existing plants with or without existing SNCR. Can be used with NH_3 as slip catalyst with SNCR
Selective non-catalytic reduction (SNCR)	NOx emissions 80 -180 mg/m^3 Lower energy consumption than SCR Lower costs than SCR	Relies on an optimum temperature around 900 °C, and sufficient retention time for reduction May lead to Ammonia slip	Port injection locations	All plant unless lower NOx release required for local environmental protection.
Reagent Type: Ammonia	Likely to be BAT	More difficult to handle Lower nitrous oxide formation Narrower temperature window		All plant
Reagent Type: Urea	Likely to be BAT	Higher N_2O emissions than ammonia, optimisation particularly important		All plant

The Applicant proposes to implement the following primary measures:

- Low NO_x burners – this technique reduces NO_x at source and is defined as BAT where auxiliary burners are required.

- Optimise primary and secondary air injection – this technique is BAT for all plant. Air staging is adopted in which primary air is fed from beneath the grate to maintain combustion and secondary air is added above the grate to complete fuel burnout.
- Flue gas recirculation – this technique reduces the consumption of reagents for secondary NO_x control and can increase overall energy recovery, although in some applications there can be corrosion problems.

There are three recognised techniques for secondary measures to reduce NO_x. These are Selective Catalytic Reduction (SCR), SCR by catalytic filter bags and Selective Non-Catalytic Reduction (SNCR) with or without catalytic filter bags. For each technique, there is a choice of urea or ammonia reagent.

SCR can reduce NO_x levels to below 50 mg/m^3 and can be applied to all plant, it is generally more expensive than SNCR and requires reheating of the waste gas stream which reduces energy efficiency, periodic replacement of the catalysts also produces a hazardous waste. The use of SCR by catalytic filter bags can reduce emissions to 50 -120 mg/m^3 with low investment costs. SNCR can typically reduce NO_x levels to between 80 and 180 mg/m^3, it relies on an optimum temperature of around 900 ^oC and sufficient retention time for reduction. SNCR is more likely to have higher levels of ammonia slip. The technique can be applied to all plant unless lower NO_x releases are required for local environmental protection. Urea or ammonia can be used as the reagent with either technique, urea is somewhat easier to handle than ammonia and has a wider operating temperature window, but tends to result in higher emissions of N_2O. Both reagents are BAT, and the use of one over the other is not normally significant in environmental terms.

The Applicant proposes to use SNCR with ammonia / urea as the reagent.

Emissions of NO_x cannot be screened out as insignificant. Therefore the Applicant has carried out a cost / benefit study of the alternative techniques. The cost per tonne of NO_x abated over the projected life of the plant has been calculated and compared with the environmental impact as shown in the table below.

	Cost of NO_x removal £/tonne	PC (long term)	PEC (long term)
SCR	5,848	0.13	24.73
SNCR	944	0.23	24.83

Based on the figures above the Applicant considers that the additional cost of SCR over SNCR is not justified by the reduction in environmental impact. Thus SCR is not BAT in this case, and SNCR is BAT for the Installation. The Applicant has justified the use of urea / ammonia as the reagent on the basis that either reagent can be BAT. The Environment Agency agrees with this assessment.

Catalytic filter bags were not proposed. The flue gas temperature is ~140 ^{o}C which is too low for effective abatement from catalytic filter bags and the proposals are designed to achieve the BAT EALs without this additional abatement

The amount of urea / ammonia used for NO_x abatement will need to be optimised to maximise NO_x reduction and minimise NH_3 slip. Improvement condition IC5 requires the Operator to report to the Environment Agency on optimising the performance of the NO_x abatement system. The BAT AEL for ammonia has been set and the Operator is also required to monitor and report on N_2O emissions every 3 months.

6.2.3 Acid Gases, SO_x, HCl and HF

Acid gases and halogens : Primary Measures				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Low sulphur fuel, (< 0.1%S gasoil or natural gas)	Reduces SOx at source		Start-up, supplementary firing.	Where auxiliary fuel required.
Management of waste streams	Disperses sources of acid gases (e.g. PVC) through feed.	Requires closer control of waste management		All plant with heterogeneous waste feed

Acid gases and halogens : Secondary Measures (BAT is to apply Primary Measures first)				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Wet	High reaction rates Low solid residues production Reagent delivery may be optimised by concentration and flow rate	Large effluent disposal and water consumption if not fully treated for re-cycle Effluent treatment plant required May result in wet plume Energy required for effluent treatment and plume reheat		Used for wide range of waste types Can be used as polishing step after other techniques where emissions are high or variable
Dry	Low water use Higher reagent consumption to achieve emissions of	Higher solid residue production Reagent consumption controlled only by input rate		All plant

	other FGC techniques but may be reduced by recycling in plant Lower energy use Higher reliability Lowest visible plume potential			
Semi-dry (also described as semi-wet in the Bref)	Medium reaction rates Reagent delivery may be varied by concentration and input rate	Higher solid waste residues than wet but lower than dry system		All plant
Direct injection into boiler	Reduced acid loading to subsequent cleaning stages. Reduced peak emissions and reduced reagent usage			Generally applicable to grate and rotary kiln plants.
Direction desulphurisation	Reduced boiler corrosion	Does not improve overall performance. Can affect bottom ash quality. Corrosion problems in flue gas cleaning system.		Partial abatement upstream of other techniques in fluidised beds

Reagent Type: Sodium Hydroxide	Highest removal rates Low solid waste production	Corrosive material ETP sludge for disposal		HWIs
Reagent Type: Lime	Very good removal rates Low leaching solid residue Temperature of reaction well suited to use with bag filters	Corrosive material May give greater residue volume if no in-plant recycle	Wide range of uses	MWIs, CWIs
Reagent Type: Sodium Bicarbonate	Good removal rates Easiest to handle Dry recycle systems proven	Efficient temperature range may be at upper end for use with bag filters Leachable solid residues Bicarbonate more expensive	Not proven at large plant	CWIs

The Applicant proposes to implement the following primary measures:

- Use of low sulphur fuels for start up and auxiliary burners – gas should be used if available, where fuel oil is used, this will be low sulphur (i.e. <0.1%), this will reduce SO_x at source. The Applicant has justified its choice of gas oil as the support fuel on the basis that that gas oil is easier to store and there is no high pressure gas main nearby.
- Management of heterogeneous wastes – this will disperse problem wastes such as PVC by ensuring a homogeneous waste feed.

There are five recognised techniques for secondary measures to reduce acid gases, all of which can be BAT. These are wet, dry, semi-dry, boiler sorbent injection and direct desulphurisation. Wet scrubbing produces an effluent for

treatment and disposal in compliance with Article 46(3) of IED. It will also require reheat of the exhaust to avoid a visible plume. Wet scrubbing is unlikely to be BAT except where there are high acid gas and metal components in the exhaust gas as may be the case for some hazardous waste incinerators. In this case, the Applicant does not propose using wet scrubbing, and the Environment Agency agrees that wet scrubbing is not appropriate in this case. Direct desulphurisation is only applicable for fluidised bed furnaces.

The Applicant has considered dry and semi-dry methods of secondary measures for acid gas abatement. Any of these methods can be BAT for this type of facility.

Both dry and semi-dry methods rely on the dosing of powdered materials into the exhaust gas stream. Semi-dry systems (i.e. hydrated reagent) offer reduced material consumption through faster reaction rates, but reagent recycling in dry systems can offset this.

In both dry and semi-dry systems, the injected powdered reagent reacts with the acid gases and is removed from the gas stream by the bag filter system. The powdered materials are either lime or sodium bicarbonate. Both are effective at reducing acid gases, and dosing rates can be controlled from continuously monitoring acid gas emissions. The decision on which reagent to use is normally economic. Lime produces a lower leaching solid residue in the APC residues than sodium bicarbonate and the reaction temperature is well suited to bag filters, it tends to be lower cost, but it is a corrosive material and can generate a greater volume of solid waste residues than sodium bicarbonate. Both reagents are BAT, and the use of one over the other is not significant in environmental terms in this case.

Direct boiler injection is applicable for all plants and can improve overall performance of the acid gas abatement system as well as reducing reagent usage. This was not proposed by the Application on the basis that their reactor at the point of reagent injection shall be sized to ensure the flue gas velocity is sufficient to carry the injected material to the inlet of the fabric filter whilst allowing minimal drop out. The proposed arrangement above allows control of reagent injection and intimate mixing of the sorbents with flue gas, both in the time of flight, but also when forming a stable, coherent, filter cake on the baghouse filters.

Reagent use will be optimised. Improvement condition IC5 requires a report on this to be submitted to the Environment Agency.

In this case, the Applicant proposes dry or semi dry lime. The Environment Agency is satisfied that this is BAT

6.2.4 Carbon monoxide and volatile organic compounds (VOCs)

The prevention and minimisation of emissions of carbon monoxide and volatile organic compounds is through the optimisation of combustion controls, where all measures will increase the oxidation of these species.

Carbon monoxide and volatile organic compounds (VOCs)				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Optimise combustion control	All measures will increase oxidation of these species.		Covered in section on furnace selection	All plants

6.2.5 Dioxins and furans (and Other POPs)

Dioxins and furans				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Optimise combustion control	All measures will increase oxidation of these species.		Covered in section on furnace selection	All plants
Avoid *de novo* synthesis			Covered in boiler design	All plant
Effective Particulate matter removal			Covered in section on particulate matter	All plant
Activated Carbon injection	Can be combined with acid gas absorber or fed separately. Metallic mercury is also absorbed.	Combined feed rate usually controlled by acid gas content.		All plant. Separate feed normally BAT unless feed is constant and acid gas control also controls dioxin release.
Catalytic filter bags	High destruction efficiency	Does not remove mercury. Higher cost than non-catalytic filter bags		

The prevention and minimisation of emissions of dioxins and furans is achieved through:

- optimisation of combustion control including the maintenance of permit conditions on combustion temperature and residence time, which has been considered in 6.1.1 above;
- avoidance of de novo synthesis, which has been covered in the consideration of boiler design;
- the effective removal of particulate matter, which has been considered in 6.2.1 above;
- injection of activated carbon. This can be combined with the acid gas reagent or dosed separately. Where the feed is combined, the combined feed rate will be controlled by the acid gas concentration in the exhaust. Therefore, separate feed of activated carbon would normally be considered BAT unless the feed was relatively constant. Effective control of acid gas emissions also assists in the control of dioxin releases.
- Use of catalytic filter bags. These can achieve low levels of emissions but mercury is not removed. These are not installed but could be deployed as a risk mitigation measure.

In this case the Applicant proposes separate feed and we are satisfied their proposals are BAT.

6.2.6 Metals

Metals				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Effective Particulate matter removal			Covered in section on particulate matter	All plant
Activated Carbon injection for mercury recovery	Can be combined with acid gas absorber or fed separately. Can be impregnated with bromine or sulphur to enhance reactivity, for use during peak emissions.	Combined feed rate usually controlled by acid gas content.		All plant. Separate feed normally BAT unless feed is constant and acid gas control also controls dioxin release.
Fixed or moving bed adsorption	Mainly for mercury and other metals, as well as organic compounds			Limited applicability due to pressure drop

Boiler bromine injection	Injection during mercury peaks. Oxidation of mercury leading to improved removal in downstream removal method.	Consumption of aqueous bromine. Can lead to formation of polybrominated dioxins. Can damage bag filter. Effects can be limited use is restricted to dealing with peak emissions		Not suitable for pyrolysis or gasification. Can deal with mercury peaks.

The prevention and minimisation of metal emissions is achieved through the effective removal of particulate matter, and this has been considered in 6.2.1 above.

Unlike other metals however, mercury if present will be in the vapour phase. BAT for mercury removal is one or a combination of the techniques listed above. The Applicant has proposed dosing of activated carbon into the exhaust gas stream. This can be combined with the acid gas reagent or dosed separately. Where the feed is combined, the combined feed rate will be controlled by the acid gas concentration in the exhaust. Therefore, separate feed of activated carbon would normally be considered BAT unless the feed was relatively constant.

In this case the Applicant proposes separate feed and we are satisfied their proposals are BAT. We are satisfied that

6.3 BAT and global warming potential

This section summarises the assessment of greenhouse gas impacts which has been made in the determination of this Permit. Emissions of carbon dioxide (CO_2) and other greenhouse gases differ from those of other pollutants in that, except at gross levels, they have no localised environmental impact. Their impact is at a global level and in terms of climate change. Nonetheless, CO_2 is clearly a pollutant for IED purposes.

The principal greenhouse gas emitted is CO_2, but the plant also emits small amounts of N_2O arising from the operation of secondary NO_x abatement. N_2O has a global warming potential 310 times that of CO_2. The Applicant will therefore be required to optimise the performance of the secondary NO_x abatement system to ensure its GWP impact is minimised.

The major source of greenhouse gas emissions from the installation is however CO_2 from the combustion of waste. There will also be CO_2 emissions from the burning of support fuels at start up, shut down and should it be necessary to maintain combustion temperatures. BAT for greenhouse gas emissions is to maximise energy recovery and efficiency.

The electricity that is generated by the Installation will displace emissions of CO_2 elsewhere in the UK, as virgin fossil fuels will not be burnt to create the same electricity.

The Installation is not subject to the Greenhouse Gas Emissions Trading Scheme Regulations 2012 therefore it is a requirement of IED to investigate how emissions of greenhouse gases emitted from the installation might be prevented or minimised.

Factors influencing GWP and CO_2 emissions from the Installation are:
On the debit side

- CO_2 emissions from the burning of the waste;
- CO_2 emissions from burning auxiliary or supplementary fuels;
- CO_2 emissions associated with electrical energy used;
- N_2O from the de-NOx process.

On the credit side

- CO_2 saved from the export of electricity to the public supply by displacement of burning of virgin fuels;

The GWP of the plant will be dominated by the emissions of carbon dioxide that are released as a result of waste combustion. This will constant for all options considered in the BAT assessment. Any differences in the GWP of the options in the BAT appraisal will therefore arise from small differences in energy recovery and in the amount of N_2O emitted.

The Applicant considered energy efficiency and BAT for the de-NOx process in its BAT assessment. This is set out in sections 4.3.7, 6.1.1 and 6.2.2 of this decision document.

Note: avoidance of methane which would be formed if the waste was landfilled has not been included in this assessment. If it were included due to its avoidance it would be included on the credit side. Ammonia has no direct GWP effect.

Taking all these factors into account, the Operator's assessment shows their preferred option is best in terms of GWP.

The Environment Agency agrees with this assessment and that the chosen option is BAT for the installation.

6.4 BAT and POPs

International action on Persistent Organic pollutants (POPs) is required under the UN's Stockholm Convention, which entered into force in 2004. The EU implemented the Convention through the POPs Regulation (2019/1021), which is directly applicable in UK law. The Environment Agency is required by national POPs Regulations (SI 2007 No 3106) to give effect to Article 6(3) of the EC POPs Regulation when determining applications for environmental Permits.

However, it needs to be borne in mind that this application is for a particular type of installation, namely a waste incinerator. The Stockholm Convention distinguishes between intentionally-produced and unintentionally-produced POPs. Intentionally-produced POPs are those used deliberately (mainly in the past) in agriculture (primarily as pesticides) and industry. Those intentionally-produced POPs are not relevant where waste incineration is concerned, as in fact high-temperature incineration is one of the prescribed methods for destroying POPs.

The unintentionally-produced POPs addressed by the Convention are:

- dioxins and furans;
- HCB (hexachlorobenzene)
- PCBs (polychlorobiphenyls) and
- PeCB (pentachlorobenzene)

The UK's national implementation plan for the Stockholm Convention, published in 2007, makes explicit that the relevant controls for unintentionally-produced POPs, such as might be produced by waste incineration, are delivered through the requirements of IED. That would include an examination of BAT, including potential alternative techniques, with a view to preventing or minimising harmful emissions. These have been applied as explained in this document, which explicitly addresses alternative techniques and BAT for the minimisation of emissions of dioxins.

Our legal obligation, under regulation 4(b) of the POPs Regulations, is, when considering an application for an environmental permit, to comply with article 6(3) of the POPs Regulation:

> "Member States shall, when considering proposals to construct new facilities or to significantly modify existing facilities using processes that release chemicals listed in Annex III , give priority consideration to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of substances listed in Annex III, without prejudice to Directive 2010/75/EU of the European Parliament and of the Council"

The 1998 Protocol to the Convention recommended that unintentionally produced POPs should be controlled by imposing emission limits (e.g 0.1 ng/m^3 for MWIs) and using BAT for incineration. UN Economic Commission for Europe (Executive Body for the Convention) (ECE-EB) produced BAT

guidance for the parties to the Convention in 2009. This document considers various control techniques and concludes that primary measures involving management of feed material by reducing halogenated substances are not technically effective. This is not surprising because halogenated wastes still need to be disposed of and because POPs can be generated from relatively low concentrations of halogens. In summary, the successful control techniques for waste incinerators listed in the ECE-EB BAT are:

- maintaining furnace temperature of 850^{o}C and a combustion gas residence time of at least 2 seconds
- rapid cooling of flue gases to avoid the *de novo* reformation temperature range of 250-450^{o}C
- use of bag filters and the injection of activated carbon or coke to adsorb residual POPs components.

Using the methods listed above, the UN-ECE BAT document concludes that incinerators can achieve an emission concentration of 0.1 ng TEQ/m^3.

We believe that the Permit ensures that the formation and release of POPs will be prevented or minimised. As we explain above, high-temperature incineration is one of the prescribed methods for destroying POPs. Permit conditions are based on the use of BAT and Chapter IV of IED and incorporate all the above requirements of the UN-ECE BAT guidance and deliver the requirements of the Stockholm Convention in relation to unintentionally produced POPs.

The release of **dioxins and furans** to air is required by the IED to be assessed against the I-TEQ (International Toxic Equivalence) limit of 0.1 ng/m^3. Further development of the understanding of the harm caused by dioxins has resulted in the World Health Organisation (WHO) producing updated factors to calculate the WHO-TEQ value. Certain **PCBs** have structures which make them behave like dioxins (dioxin-like PCBs), and these also have toxic equivalence factors defined by WHO to make them capable of being considered together with dioxins. The UK's independent health advisory committee, the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) has adopted WHO-TEQ values for both dioxins and dioxin-like PCBs in their review of Tolerable Daily Intake (TDI) criteria. The Permit requires that, in addition to the requirements of the IED, the WHO-TEQ values for both dioxins and dioxin-like PCBs should be monitored for reporting purposes, to enable evaluation of exposure to dioxins and dioxin-like PCBs to be made using the revised TDI recommended by COT. The release of dioxin-like PCBs and PAHs is expected to be low where measures have been taken to control dioxin releases. The Permit also requires monitoring of a range of PAHs and dioxin-like PCBs at the same frequency as dioxins are monitored. We have included a requirement to monitor and report against these WHO-TEQ values for dioxins and dioxin-like PCBs and the range of PAHs as listed in the Permit. We are confident that the measures taken to control the release of dioxins will also control the releases of dioxin-like PCBs and PAHs. Section 5.2.1 of this document details the assessment of emissions to air, which includes dioxins and concludes that

there will be no adverse effect on human health from either normal or abnormal operation.

Hexachlorobenzene (HCB) is released into the atmosphere as an accidental product from the combustion of coal, waste incineration and certain metal processes. It has also been used as a fungicide, especially for seed treatment although this use has been banned in the UK since 1975. Natural fires and volcanoes may serve as natural sources. Releases of (HCB) are addressed by the European Environment Agency (EEA), which advises that:

> "*due to comparatively low levels in emissions from most (combustion) processes special measures for HCB control are usually not proposed. HCB emissions can be controlled generally like other chlorinated organic compounds in emissions, for instance dioxins/furans and PCBs: regulation of time of combustion, combustion temperature, temperature in cleaning devices, sorbents application for waste gases cleaning etc*." [reference http://www.eea.europa.eu/publications/EMEPCORINAIR4/sources_of_HCB.pdf]

Pentachlorobenzene (PeCB) is another of the POPs list to be considered under incineration. PeCB has been used as a fungicide or flame retardant, there is no data available however on production, recent or past, outside the UN-ECE region. PeCBs can be emitted from the same sources as for PCDD/F: waste incineration, thermal metallurgic processes and combustion plants providing energy. As discussed above, the control techniques described in the UN-ECE BAT guidance and included in the permit, are effective in controlling the emissions of all relevant POPs including PeCB.

We have assessed the control techniques proposed for dioxins by the Applicant and have concluded that they are appropriate for dioxin control. We are confident that these controls are in line with the UN-ECE BAT guidance and will minimise the release of HCB, PCB and PeCB.

We are therefore satisfied that the substantive requirements of the Convention and the POPs Regulation have been addressed and complied with.

6.5 Other Emissions to the Environment

6.5.1 Emissions to water

There will not be any process emissions to water or sewer from the Installation under normal operation. Liquid effluents will be produced from processes such as boiler blow-down and from back-washing / regeneration of the water demineralisation plant. This water is collected within the dirty water tank situated below the air cooled condensers. This water is reused in the ash hopper to quench the hot IBA discharge before it enters the ash loading area. There is a continual requirement for water at this stage of the process and it is normal that this will need to be topped up with clean water. This water will then either evaporate into the flue gas or be retained as moisture in the ash,

which is subsequently transported offsite for treatment. As the IBA quenching requirements will exceed the volume of process water, there will be no process water emissions from the site.

The Installation would give rise to surface water run-off from on-site roads, vehicle parking areas, roofs of buildings and other hardstanding; some of the roof water would be diverted to a rainwater harvesting tank located in the main building for use within the Installation. The remaining surface water run-off will be passed through oil interceptors and silt traps prior to discharge into the Power Station surface water drainage system.
In order to further prevent potentially contaminative emissions to surface water, the discharge point (W1) would be subject to continuous pH measurement and daily visual inspection for the presence of oil.

Based upon the information in the application we are satisfied that appropriate measures will be in place to prevent and /or minimise emissions to water.

6.5.2 Emissions to sewer

There will be no process emissions to sewer from the Installation.

Any foul water generated by the Installation will be collected in the dirty water pit.

All foul-water associated with site ancillary operations (i.e. kitchens, bathroom facilities, etc) will be routed to the septic tank.

The contents of the tank and the dirty water pit will be emptied on a regular basis by a tanker and taken offsite to a suitable sewage treatment facility.

Based upon the information in the application we are satisfied that appropriate measures will be in place to prevent and /or minimise emissions to sewer.

6.5.3 Fugitive emissions

The IED specifies that plants must be able to demonstrate that the plant is designed in such a way as to prevent the unauthorised and accidental release of polluting substances into soil, surface water and groundwater. In addition storage requirements for waste and for contaminated water of Article 46(5) must be arranged.

- The fuel oil, ammonia storage tanks and boiler treatment chemicals will be bunded and in an area with concrete hardstanding and contained drainage.
- Lime and activated carbon will be stored in silos in an area with concrete hardstanding and contained drainage.
- Tanker offloading of chemicals will take place in area with contained drainage.
- Spillage absorbent materials available if required.
- Spillage procedures.

- Firewater would be contained onsite.
- Waste is contained within a sealed, maintained bunker

Based upon the information in the application we are satisfied that appropriate measures will be in place to prevent and /or minimise fugitive emissions.

6.5.4 Odour

Based upon the information in the application we are satisfied that the appropriate measures will be in place to prevent or where that is not practicable to minimise odour and to prevent pollution from odour.

Waste accepted at the installation will be delivered in covered vehicles or within containers and bulk storage of waste will only occur in the installation's waste bunker. All doors to the tipping hall will remain closed outside of the waste delivery periods and combustion air will be drawn from above the waste storage bunker in order to prevent odours and airborne particulates from leaving the facility building.

The Applicant proposed the following to control odour during shut-down:

- It is not likely that both lines will be shut-down at the same time, so negative pressure will be maintained.
- The amount of waste stored will be minimised before a shut-down.
- The bunker hall doors will be kept closed.
- Waste will be diverted to other facilities.

The above measures are in line with BAT conclusion 21.

In addition, the Applicant proposed an odour neutralising misting system that could be used in the event of odour during shutdown. Although we do not endorse this method of odour control, we are satisfied that along with the other methods proposed by the Applicant there will not be any significant issues due to odour.

6.5.5 Noise and vibration

The Application proposed several noise control measure including the following key measures:

- Noisy plant items, where practicable, will be installed inside buildings rather than outside and, where appropriate, they will be fitted with noise insulation or silencer.
- The installation will be designed to reduce noise and tonal components.
- The ACCs will be located to the northwest of the site where the local terrain and the main installation building will provide a barrier to reduce noise propagation to the closest receptors.
- Regular maintenance of plant items will be carried out.
- Mobile plant vehicles fitted with non-tonal reversing alarms

- Doors will be shut when not in use.
- Noise level checks will be carried out regularly in operational areas, with early warning of increasing noise levels resulting in reduction or mitigation.
- The majority of waste deliveries will occur during daytime periods.
- Waste vehicle movements at night will be limited.
- Noise level checks will be carried out regularly in operational areas, with early warning of increasing noise levels resulting in reduction or mitigation.
- Significant vibration effects are not anticipated for the plant. Any vibration issues associated with the plant will be resolved during commissioning. In the event of a complaint, the complaints procedure will be followed to record and act on the complaint and instigate appropriate action.

Based upon the information in the application we are satisfied that the appropriate measures will be in place to prevent or where that is not practicable to minimise noise and vibration and to prevent pollution from noise and vibration outside the site.

The application contained a noise impact assessment which identified local noise-sensitive receptors, potential sources of noise at the proposed plant and noise attenuation measures. Measurements were taken of the prevailing ambient noise levels to produce a baseline noise survey and an assessment was carried out in accordance with BS 4142:2014 to compare the predicted plant rating noise levels with the established background levels.

The assessment showed that the noise rating level at the most impacted receptor would be up to two dB below background during the day time and up to five dB above background during night-time

We audited the Applicant’s assessment. We were satisfied that there would not be an adverse impact from noise provided the Applicant implemented the additional mitigation measures that were proposed in their noise assessment. We have set pre-operational condition PO9 to ensure that these measures, or equivalent measures are implemented

6.6 Setting ELVs and other Permit conditions

6.6.1 Translating BAT into Permit conditions

Article 14(3) of IED states that BAT conclusions shall be the reference for permit conditions. Article 15(3) further requires that under normal operating conditions; emissions do not exceed the emission levels associated with the best available techniques as laid down in the decisions on BAT conclusions.

BAT conclusions for waste incineration or co-incineration were published on 12 November 2019.

The use of BAT AELs and IED Chapter IV emission limits for air dispersion modelling sets the worst case scenario. If this shows emissions are insignificant then we have accepted that the Applicant's proposals are BAT, and that there is no justification to reduce ELVs below the BAT AELs and Chapter IV limits.

Below we consider whether, for those emission not screened out as insignificant, different conditions are required as a result of consideration of local or other factors, so that no significant pollution is caused (Article 11(c)) or to comply with environmental quality standards (Article 18).

(i) Local factors

We have considered the following information…

(ii) National and European ESs

No specific additional conditions were required.

(iii) Global Warming

CO_2 is an inevitable product of the combustion of waste. The amount of CO_2 emitted will be essentially determined by the quantity and characteristics of waste being incinerated, which are already subject to conditions in the Permit. It is therefore inappropriate to set an emission limit value for CO_2, which could do no more than recognise what is going to be emitted. The gas is not therefore targeted as a key pollutant under Annex II of IED, which lists the main polluting substances that are to be considered when setting emission limit values (ELVs) in Permits.

We have therefore considered setting equivalent parameters or technical measures for CO_2. However, provided energy is recovered efficiently (see section 4.3.7 above), there are no additional equivalent technical measures (beyond those relating to the quantity and characteristics of the waste) that can be imposed that do not run counter to the primary purpose of the plant, which is the destruction of waste/recovery of energy from waste. Controls in the form of restrictions on the volume and type of waste that can be accepted

at the Installation and permit conditions relating to energy efficiency effectively apply equivalent technical measures to limit CO_2 emissions.

(iv) Commissioning

Pre-operational condition was set for the Operator to submit a commissioning plan.

6.7 Monitoring

6.7.1 Monitoring during normal operations

We have decided that monitoring should be carried out for the parameters listed in Schedule 3 using the methods and to the frequencies specified in those tables. These monitoring requirements have been imposed in order to demonstrate compliance with emission limit values and to enable correction of measured concentration of substances to the appropriate reference conditions; to gather information about the performance of the SNCR system; to establish data on the release of dioxin-like PCBs and PAHs from the incineration process and to deliver the requirements of Chapter IV of IED for monitoring of residues and temperature in the combustion chamber.

For emissions to air, the methods for continuous and periodic monitoring are in accordance with the Environment Agency's Guidance M2 for monitoring of stack emissions to air.

Based on the information in the Application and the requirements set in the conditions of the permit we are satisfied that the Operator's techniques, personnel and equipment will have either MCERTS certification or MCERTS accreditation as appropriate.

6.7.2 Monitoring under abnormal operations arising from the failure of the installed CEMs

The Operator has stated that they will provide back-up CEMS working in parallel to the operating CEMS. These will be switched into full operation immediately in the event that there is any failure in the regular monitoring equipment. The back-up CEMS measure the same parameters as the operating CEMS. In the unlikely event that the back-up CEMS also fail Condition 2.3.13 of the permit requires that the abnormal operating conditions apply.

6.7.3 Continuous emissions monitoring for dioxins and heavy metals

The BAT conclusions specify either manual extractive monitoring or long term monitoring for dioxins. For mercury either continuous or long term monitoring is specified, manual extractive monitoring is specified for other metals.

For dioxins long term monitoring does not apply if emissions are stable, and for mercury long term monitoring can be used instead of continuous if the mercury content of the waste is low and stable.

Based on the waste types and control measures proposed in the Application we expect that emissions of dioxins will be stable and that the mercury content of the waste will be low and stable. We have therefore set manual extractive monitoring in the Permit. However the Permit requires the stable and low criteria to be demonstrated through improvement conditions IC9 and IC10 and we can require long term monitoring for dioxins and continuous monitoring for mercury if required.

6.7.4 Monitoring during periods of 'other than normal operation' (OTNOC)

BAT AELs (daily averages) do not apply during period of OTNOC. However IED chapter IV limits will apply during these periods. Permit table S3.1(b) contains appropriate limits and monitoring requirements during OTNOC. Pre-operational condition PO1 will ensure OTNOC scenarios are defined.

6.8 Reporting

We have specified the reporting requirements in Schedule 5 of the Permit either to meet the reporting requirements set out in the IED, or to ensure data is reported to enable timely review by the Environment Agency to ensure compliance with permit conditions and to monitor the efficiency of material use and energy recovery at the installation.

7 Other legal requirements

In this section we explain how we have addressed other relevant legal requirements, to the extent that we have not addressed them elsewhere in this document.

7.1 The EPR 2016 and related Directives

The EPR delivers the requirements of a number of European and national laws.

7.1.1 Schedules 1 and 7 to the EPR 2016 – **IED Directive**

We address the requirements of the IED in the body of this document above and the specific requirements of Chapter IV in Annex 1 of this document.

There is one requirement not addressed above, which is that contained in Article 5(3) IED. Article 5(3) requires that "In the case of a new installation or a substantial change where Article 4 of Directive 85/337/EC (now Directive 2011/92/EU) (the EIA Directive) applies, any relevant information obtained or conclusion arrived at pursuant to articles 5, 6 and 7 of that Directive shall be examined and used for the purposes of granting the permit."

- Article 5 of EIA Directive relates to the obligation on developers to supply the information set out in Annex IV of the Directive when making an application for development consent.
- Article 6(1) requires Member States to ensure that the authorities likely to be concerned by a development by reason of their specific environmental responsibilities are consulted on the Environmental Statement and the request for development consent.
- Article 6(2)-6(6) makes provision for public consultation on applications for development consent.
- Article 7 relates to projects with transboundary effects and consequential obligations to consult with affected Member States.

The grant or refusal of development consent is a matter for the relevant local planning authority. The Environment Agency's obligation is therefore to examine and use any relevant information obtained or conclusion arrived at by the local planning authorities pursuant to those EIA Directive articles.

In determining the Application we have considered the following documents: -

- The Environmental Statement submitted with the planning application (which also formed part of the Environmental Permit Application).
- The response of the Environment Agency to the local planning authority in its role as consultee to the planning process.

We have complied with our obligation under Article 9(2) so far as we are able in that no conclusion has yet been arrived at. From consideration of the Environmental Statement and our response as consultee to the planning process we are satisfied that no additional or different permit conditions are necessary.

The Environment Agency has also carried out its own consultation on the Environmental Permitting Application which includes the Environmental Statement submitted to the local planning authority. The results of our consultation are described elsewhere in this decision document.

7.1.2 Schedule 9 to the EPR 2016 – **Waste Framework Directive**

As the Installation involves the treatment of waste, it is carrying out a *waste operation* for the purposes of the EPR 2016, and the requirements of Schedule 9 therefore apply. This means that we must exercise our functions so as to ensure implementation of certain articles of the WFD.

We must exercise our relevant functions for the purposes of ensuring that the waste hierarchy referred to in Article 4 of the Waste Framework Directive is applied to the generation of waste and that any waste generated is treated in accordance with Article 4 of the Waste Framework Directive. (See also section 4.3.9)

The conditions of the permit ensure that waste generation from the facility is minimised. Where the production of waste cannot be prevented it will be recovered wherever possible or otherwise disposed of in a manner that minimises its impact on the environment. This is in accordance with Article 4.

We must also exercise our relevant functions for the purposes of implementing Article 13 of the Waste Framework Directive; ensuring that the requirements in the second paragraph of Article 23(1) of the Waste Framework Directive are met; and ensuring compliance with Articles 18(2)(b), 18(2)(c), 23(3), 23(4) and 35(1) of the Waste Framework Directive.

Article 13 relates to the protection of human health and the environment. These objectives are addressed elsewhere in this document.

Article 23(1) requires the permit to specify:

- the types and quantities of waste that may be treated;
- for each type of operation permitted, the technical and any other requirements relevant to the site concerned;
- the safety and precautionary measures to be taken;
- the method to be used for each type of operation;
- such monitoring and control operations as may be necessary;
- such closure and after-care provisions as may be necessary.

These are all covered by permit conditions.

The permit does not allow the mixing of hazardous waste so Article 18(2) is not relevant.

We consider that the intended method of waste treatment is acceptable from the point of view of environmental protection so Article 23(3) does not apply. Energy efficiency is dealt with elsewhere in this document but we consider the conditions of the permit ensure that the recovery of energy take place with a high level of energy efficiency in accordance with Article 23(4).

Article 35(1) relates to record keeping and its requirements are delivered through permit conditions.

7.1.3 Schedule 22 to the EPR 2016 – **Water Framework and Groundwater Directives**

To the extent that it might lead to a discharge of pollutants to groundwater (a "groundwater activity" under the EPR 2016), the Permit is subject to the requirements of Schedule 22, which delivers the requirements of EU Directives relating to pollution of groundwater. The Permit will require the taking of all necessary measures to prevent the input of any hazardous substances to groundwater, and to limit the input of non-hazardous pollutants into groundwater so as to ensure such pollutants do not cause pollution, and satisfies the requirements of Schedule 22.

No releases to groundwater from the Installation are permitted. The Permit also requires material storage areas to be designed and maintained to a high standard to prevent accidental releases.

7.1.4 Directive 2003/35/EC – **The Public Participation Directive**

Regulation 60 of the EPR 2016 requires the Environment Agency to prepare and publish a statement of its policies for complying with its public participation duties. We have published our public participation statement.

This Application has been consulted upon in line with this statement, as well as with our guidance RGS6 on Sites of High Public Interest, which addresses specifically extended consultation arrangements for determinations where public interest is particularly high. This satisfies the requirements of the Public Participation Directive.

Our decision in this case has been reached following a programme of extended public consultation, both on the original application and later, separately, on the draft permit and a draft decision document. The way in which this has been done is set out in Section 2. A summary of the responses received to our consultations and our consideration of them is set out in Annex 4.

7.2 National primary legislation

7.2.1 **Environment Act 1995**

(i) Section 4 (Pursuit of Sustainable Development)

We are required to contribute towards achieving sustainable development, as considered appropriate by Ministers and set out in guidance issued to us. The Secretary of State for Environment, Food and Rural Affairs has issued *The Environment Agency's Objectives and Contribution to Sustainable Development: Statutory Guidance (December 2002)*. This document:

> "*provides guidance to the Agency on such matters as the formulation of approaches that the Agency should take to its work, decisions about priorities for the Agency and the allocation of resources. It is not directly applicable to individual regulatory decisions of the Agency*".

In respect of regulation of industrial pollution through the EPR, the Guidance refers in particular to the objective of setting permit conditions "*in a consistent and proportionate fashion based on Best Available Techniques and taking into account all relevant matters…*". The Environment Agency considers that it has pursued the objectives set out in the Government's guidance, where relevant, and that there are no additional conditions that should be included in this Permit to take account of the Section 4 duty.

(ii) Section 5 (Preventing or Minimising Effects of Pollution of the Environment)

We are satisfied that our pollution control powers have been exercised for the purpose of preventing or minimising, remedying or mitigating the effects of pollution.

(iii) Section 6(1) (Conservation Duties with Regard to Water)

We have a duty to the extent we consider it desirable generally to promote the conservation and enhancement of the natural beauty and amenity of inland and coastal waters and the land associated with such waters, and the conservation of flora and fauna which are dependent on an aquatic environment.

We consider that no additional or different conditions are appropriate for this Permit.

(iv) Section 6(6) (Fisheries)

We have a duty to maintain, improve and develop fisheries of salmon, trout, eels, lampreys, smelt and freshwater fish.

We consider that no additional or different conditions are appropriate for this Permit.

(v) Section 7 (Pursuit of Conservation Objectives)

This places a duty on us, when considering any proposal relating to our functions, to have regard amongst other things to any effect which the proposals would have on sites of archaeological, architectural, or historic interest; the economic and social well-being of local communities in rural areas; and to take into account any effect which the proposals would have on the beauty or amenity of any rural area.

We considered whether we should impose any additional or different requirements in terms of our duty to have regard to the various conservation objectives set out in Section 7, but concluded that we should not.

(vi) Section 39 (Costs and Benefits)

We have a duty to take into account the likely costs and benefits of our decisions on the applications ('costs' being defined as including costs to the environment as well as any person). This duty, however, does not affect our obligation to discharge any duties imposed upon us in other legislative provisions.

In so far as relevant we consider that the costs that the permit may impose on the applicant are reasonable and proportionate in terms of the benefits it provides.

(vii) Section 81 (National Air Quality Strategy)

We have had regard to the National Air Quality Strategy and consider that our decision complies with the Strategy, and that no additional or different conditions are appropriate for this Permit.

We have also had regard to the clean air strategy 2019 and consider that our decision complies with the Strategy, and that no additional or different conditions are appropriate for this Permit.

(viii) National Emissions Ceiling Regulations 2018

We have had regard to the National Air Pollution Control Programme and consider that our decision complies with the Strategy, and that no additional or different conditions are appropriate for this Permit.

7.2.2 **Section 108 Deregulation Act 2015 – Growth duty**

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit.
Paragraph 1.3 of the guidance says:
“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”
We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.
We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

7.2.3 **Human Rights Act 1998**

We have considered potential interference with rights addressed by the European Convention on Human Rights in reaching our decision and consider that our decision is compatible with our duties under the Human Rights Act 1998. In particular, we have considered the right to life (Article 2), the right to a fair trial (Article 6), the right to respect for private and family life (Article 8) and the right to protection of property (Article 1, First Protocol). We do not believe that Convention rights are engaged in relation to this determination.

7.2.4 **Countryside and Rights of Way Act 2000 (CROW 2000)**

Section 85 of this Act imposes a duty on Environment Agency to have regard to the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty (AONB). There is no AONB which could be affected by the Installation.

7.2.5 **Wildlife and Countryside Act 1981**

Under section 28G of the Wildlife and Countryside Act 1981 the Environment Agency has a duty to take reasonable steps to further the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which a site is of special scientific interest. Under section 28I the Environment Agency has a duty to consult Natural England in relation to any permit that is likely to damage SSSIs.

We assessed the Application and concluded that the Installation will not damage the special features of any SSSI. This was recorded on a CROW Appendix 4 form,

The CROW assessment is summarised in greater detail in section 5.4 of this document. A copy of the full Appendix 4 Assessment can be found on the public register.

7.2.6 **Natural Environment and Rural Communities Act 2006**

Section 40 of this Act requires us to have regard, so far as is consistent with the proper exercise of our functions, to the purpose of conserving biodiversity. We have done so and consider that no different or additional conditions in the Permit are required.

7.2.7 **Countryside Act 1968**

Section 11 imposes a duty on the Environment Agency to exercise its functions relating to any land, having regard to the desirability of conserving the natural beauty and amenity of the countryside including wildlife. We have done so and consider that no different or additional conditions in the Permit are required.

7.2.8 **National Parks and Access to the Countryside Act 1949**

Section 11A and section 5(1) imposes a duty on the Environment Agency when exercising its functions in relation to land in a National Park, to have regard to the purposes of conserving and enhancing the natural beauty, wildlife and cultural heritage of the areas, and of promoting opportunities for the understanding and enjoyment of National Parks by the public.

We have done so and consider that no different or additional conditions in the Permit are required. There is no National Park which could be affected by the Installation.

7.3 National secondary legislation

7.3.1 **Conservation of Habitats and Species Regulations 2017**

We have assessed the Application in accordance with guidance agreed jointly with Natural England and concluded that there will be no likely significant effect on any European Site.

The habitat assessment is summarised in greater detail in section 5.4 of this document. A copy of the full Appendix 11 Assessment can be found on the public register.

7.3.2 **Water Environment (Water Framework Directive) Regulations 2017 2003**

Consideration has been given to whether any additional requirements should be imposed in terms of the Environment Agency's duty under regulation 3 to secure compliance with the requirements of the Water Framework Directive, Groundwater directive and the EQS Directive through (inter alia) environmental permits, and its obligation in regulation 33 to have regard to the river basin management plan (RBMP) approved under regulation 31 and any supplementary plans prepared under regulation 32. However, it is felt that existing conditions are sufficient in this regard and no other appropriate requirements have been identified

We are satisfied that granting this application with the conditions proposed would not cause the current status of the water body to deteriorate.

7.3.3 **The Persistent Organic Pollutants Regulations 2007**

We have explained our approach to these Regulations, which give effect to the Stockholm Convention on POPs and the EU's POPs Regulation, above.

7.4 Other relevant legal requirements

7.4.1 Duty to Involve

S23 of the Local Democracy, Economic Development and Construction Act 2009 require us where we consider it appropriate to take such steps as we consider appropriate to secure the involvement of interested persons in the exercise of our functions by providing them with information, consulting them or involving them in any other way. S24 requires us to have regard to any Secretary of State guidance as to how we should do that.

The way in which the Environment Agency has consulted with the public and other interested parties is set out in section 2 of this document. The way in which we have taken account of the representations we have received is set out in Annex 4. Our public consultation duties are also set out in the EP Regulations, and our statutory Public Participation Statement, which implement the requirements of the Public Participation Directive. In addition to meeting our consultation responsibilities, we have also taken account of our guidance in Environment Agency Guidance Note RGS6 and the Environment Agency's Building Trust with Communities toolkit.

ANNEX 1A: APPLICATION OF CHAPTER IV OF THE INDUSTRIAL EMISSIONS DIRECTIVE

IED Article	Requirement	Delivered by
45(1)(a)	The permit shall include a list of all types of waste which may be treated using at least the types of waste set out in the European Waste List established by Decision 2000/532/EC, if possible, and containing information on the quantity of each type of waste, where appropriate.	Condition 2.3.4(a) and Table S2.2 in Schedule 2 of the Permit.
45(1)(b)	The permit shall include the total waste incinerating or co-incinerating capacity of the plant.	Condition 2.3.4(a) and Table S2.2 in Schedule 2 of the Permit.
45(1)(c)	The permit shall include the limit values for emissions into air and water.	Conditions 3.1.1 and 3.1.2 and Tables S3.1, S3.1(a), S3.1(b) and S3.2 in Schedule 3 of the Permit.
45(1)(d)	The permit shall include the requirements for pH, temperature and flow of waste water discharges.	There are no process waste water discharges.
45(1)(e)	The permit shall include the sampling and measurement procedures and frequencies to be used to comply with the conditions set for emissions monitoring.	Conditions 3.6.1 to 3.6.4 and Tables S3.1, S3.1(a), S3.1(b), S3.2, S3.3 and S3.4 in Schedule 3 of the Permit.
45(1)(f)	The permit shall include the maximum permissible period of unavoidable stoppages, disturbances or failures of the purification devices or the measurement devices, during which the emissions into the air and the discharges of waste water may exceed the prescribed emission limit values.	Conditions 2.3.13 and 2.3.14.
46(1)	Waste gases shall be discharged in a controlled way by means of a stack the height of which is calculated in such a way as to safeguard human health and the environment.	Condition 2.3.1 and Table S1.2 of Schedule 1 of the Permit.
46(2)	Emission into air shall not exceed the emission limit values set out in	Conditions 3.1.1 and 3.1.2 and Tables

IED Article	Requirement	Delivered by
	part 3 of Annex VI.	S3.1, S3.1a and S3.1(b).
46(3)	Relates to conditions for water discharges from the cleaning of exhaust gases.	There are no such discharges as condition 3.1.1 prohibits this.
46(4)	Relates to conditions for water discharges from the cleaning of exhaust gases.	There are no such discharges as condition 3.1.1 prohibits this.
46(5)	Prevention of unauthorised and accidental release of any polluting substances into soil, surface water or groundwater. Adequate storage capacity for contaminated rainwater run-off from the site or for contaminated water from spillage or fire-fighting.	The application explains the measures to be in place for achieving the directive requirements. The permit requires that these measures are used. Various permit conditions address this and when taken as a whole they ensure compliance with this requirement.
46(6)	Limits the maximum period of operation when an ELV is exceeded to 4 hours uninterrupted duration in any one instance, and with a maximum cumulative limit of 60 hours per year. Limits on dust (150 mg/m3), CO and TOC not to be exceeded during this period.	Conditions 2.3.12 and 2.3.13
47	In the event of breakdown, reduce or close down operations as soon as practicable. Limits on dust (150 mg/m3), CO and TOC not to be exceeded during this period.	Condition 2.3.9 and 2.3.13
48(1)	Monitoring of emissions is carried out in accordance with Parts 6 and 7 of Annex VI.	Conditions 3.6.1 to 3.6.4, 3.2.1, 3.2.2, tables S3.1, S3.1(a) and S3.1(b). Reference conditions are defined in Schedule 6 of the Permit.

IED Article	Requirement	Delivered by
48(2)	Installation and functioning of the automated measurement systems shall be subject to control and to annual surveillance tests as set out in point 1 of Part 6 of Annex VI.	Conditions 3.6.1, 3.6.3, table S3.1, S3.1(a) and S3.1(b), and S3.3
48(3)	The competent authority shall determine the location of sampling or measurement points to be used for monitoring of emissions.	Conditions 3.6.1. Pre-operational condition PO7
48(4)	All monitoring results shall be recorded, processed and presented in such a way as to enable the competent authority to verify compliance with the operating conditions and emission limit values which are included in the permit.	Conditions 4.1.1 and 4.1.2, and Tables S4.1 and S4.4
49	The emission limit values for air and water shall be regarded as being complied with if the conditions described in Part 8 of Annex VI are fulfilled.	Conditions 3.1.1, 3.1.2, 3.2.1, 3.2.2 and tables S3.1, S3.1(a) S3.1(b) and S3.2
50(1)	Slag and bottom ash to have Total Organic Carbon (TOC) < 3% or loss on ignition (LOI) < 5%.	Conditions 3.6.1 and Table S3.4
50(2)	Flue gas to be raised to a temperature of 850ºC for two seconds, as measured at representative point of the combustion chamber.	Condition 2.3.9, Pre-operational condition PO5, PO8 and Improvement condition IC4 and Table S3.3
50(3)	At least one auxiliary burner which must not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil liquefied gas or natural gas.	Condition 2.3.10
50(4)(a)	Automatic shut-down to prevent waste feed if at start up until the specified temperature has been reached.	Condition 2.3.9
50(4)(b)	Automatic shut-down to prevent waste feed if the combustion temperature is not maintained.	Condition 2.3.9
50(4)(c)	Automatic shut-down to prevent waste feed if the CEMs show that ELVs are exceeded due to disturbances or failure of waste cleaning devices.	Condition 2.3.9 and 2.3.13

IED Article	Requirement	Delivered by
50(5)	Any heat generated from the process shall be recovered as far as practicable.	(a) The plant will generate electricity (b) Operator to review the available heat recovery options prior to commissioning (Condition PO2) and then every 2 years (Conditions 1.2.1 to 1.2.3)
50(6)	Relates to the feeding of infectious clinical waste into the furnace.	No infectious clinical waste will be burnt
50(7)	Management of the Installation to be in the hands of a natural person who is competent to manage it.	Conditions 1.1.1 to 1.1.3 and 2.3.1 of the Permit.
51(1)	Different conditions than those laid down in Article 50(1), (2) and (3) and, as regards the temperature Article 50(4) may be authorised, provided the other requirements of this chapter are met.	No such conditions Have been allowed
51(2)	Changes in operating conditions do not cause more residues or residues with a higher content of organic polluting substances compared to those residues which could be expected under the conditions laid down in Articles 50(1), (2) and (3).	No such conditions Have been allowed
51(3)	Changes in operating conditions shall include emission limit values for CO and TOC set out in Part 3 of Annex VI.	No such conditions Have been allowed
52(1)	Take all necessary precautions concerning delivery and reception of Wastes, to prevent or minimise pollution.	Conditions 2.3.1, 2.3.3, 3.3, 3.4, 3.5 and 3.7
52(2)	Determine the mass of each category of wastes, if possible according to the EWC, prior to accepting the waste.	Condition 2.3.4(a) and Table S2.2 in Schedule 3 of the Permit.
52(3)	Prior to accepting hazardous waste, the operator shall collect available information about the waste for the purpose of compliance with the permit requirements specified in Article 45(2).	Not Applicable
52(4)	Prior to accepting hazardous waste,	Not Applicable

IED Article	Requirement	Delivered by
	the operator shall carry out the procedures set out in Article 52(4).	
52(5)	Granting of exemptions from Article 52(2), (3) and (4).	Not Applicable
53(1)	Residues to be minimised in their amount and harmfulness, and recycled where appropriate.	Conditions 1.4.1, 1.4.2 and 3.6.1 with Table S3.4
53(2)	Prevent dispersal of dry residues and dust during transport and storage.	Conditions 1.4.1, 2.3.1, 2.3.2 and 3.3.1.
53(3)	Test residues for their physical and chemical characteristics and polluting potential including heavy metal content (soluble fraction).	Condition 3.6.1 and Table S3.4 and pre-operational condition PO3.
55(1)	Application, decision and permit to be publicly available.	All documents are accessible from the Environment Agency Public Register.
55(2)	An annual report on plant operation and monitoring for all plants burning more than 2 tonne/hour waste.	Condition 4.2.2 and 4.2.3.

ANNEX 1B: COMPLIANCE WITH BAT CONCLUSIONS

BAT conclusion	Criteria	Delivered by
1	Implement environmental management system	Condition 1.1 and Pre-operational condition PO1
2	Determine gross electrical efficiency	Section 4.3.7 of this decision document. Permit table S3.3
3	Monitor key process parameters	Condition 3.6.1 and table S3.3
4	Monitoring emissions to air	Condition 3.6.1 and table S3.1
5	Monitoring emissions to air during OTNOC	Condition 3.6.1 and table S3.1(b)
6	Monitoring emissions to water from flue gas treatment and/or bottom ash treatment	There are no such emissions from the installation
7	Monitor unburnt substances in slags and bottom ashes	Conditions 3.1.4 and 3.6.1, and table S3.4
8	Analysis of hazardous waste	Not applicable
9	Waste stream management techniques	The Application explains the measures that will be used. Permit condition 2.3.1, table S1.2
10	Quality management system for bottom ash treatment plant	Not applicable
11	Monitor waste deliveries as part of waste acceptance procedures	The Application explains the measures that will be used. Permit condition 2.3.1, table S1.2
12	Reception, handling and storage of waste	Measures are described in the Application and FPP. Permit conditions 2.3.1, table S1.2 and 3.8.1
13	Storage and handling of clinical waste	Not applicable
14	Improve overall performance of plant including BAT-AELs for TOC or LOI	Techniques described in the Application. Permit condition 2.3.1, table S1.2, 3.1.4, 3.6.1 and table S3.4

BAT conclusion	Criteria	Delivered by
15	Procedures to adjust plant settings to control performance	Measures described in the Application condition 2.3.1 and table S1.2
16	Procedures to minimise start-up and shut down	Measures described in the Application
17	Appropriate design, operation and maintenance of FGC system	FGC measures described in Application. Operation and maintenance procedures will form part of the EMS
18	OTNOC management plan	Pre-operational condition PO1
19	Use of heat recovery boiler	Described in the Application. Permit condition 2.3.1, table S1.2
20	Measures to increase energy efficiency and BAT AEEL	Measures described in the Application. Permit condition 2.3.1, table S1.2 Section 4.3.7 of this decision document.
21	Measures to prevent or reduce diffuse emissions including odour	Measures described in the Application. Permit conditions 2.3.1, table S1.2, 3.4.1, 3.3.1, 3.3.2. Sections 4.2.2, 6.5.3 and 6.5.4 of this decision document.
22	Handling of gaseous and liquid wastes	Not applicable
23	Management system to prevent or reduce dust emissions from treatment of slags and ashes	Not applicable
24	Techniques to prevent or reduce diffuse emissions to air from treatment of slags and ashes	Not applicable
25	Minimisation of dust and metal emissions and compliance with BAT AEL	Section 5.2 of this decision document. Permit conditions 2.3.1, table S1.2, 3.3.1, 3.3.2, 3.1.1 and 3.1.2 and table S3.1
26	Techniques and BAT AEL for dust emissions from enclosed slags and ashes treatment	Not applicable

BAT conclusion	Criteria	Delivered by
27	Techniques to reduce emissions of HCl, HF and SO_2	Measures described in the Application. Permit condition 2.3.1 and table S1.2 Section 5.2 of this decision document.
28	Techniques to reduce peak emissions of HCl, HF and SO_2, optimise reagent use and BAT AELs	Measures described in the Application. Permit conditions 2.3.1, table S1.2, 3.1.1 and 3.1.2 and table S3.1
29	Techniques to reduce emissions of NO_2, N_2O, CO and NH_3 and BAT AELs	Measures described in the Application. Section 5.2 of this decision document. Permit conditions 2.3.1, table S1.2, 3.1.1 and 3.1.2 and table S3.1
30	Reduce emissions or organic compounds including dioxins/furans and PCBs. BAT AELs	Measures described in the Application. Section 5.2 of this decision document. Permit conditions 2.3.1, table S1.2, 3.1.1 and 3.1.2 and table S3.1
31	Reduce emissions of mercury. BAT AEL	Measures described in the Application. Section 5.2 of this decision document. Permit conditions 2.3.1, table S1.2, 3.1.1 and 3.1.2 and table S3.1
32	Segregate waste water streams to prevent contamination	Measures described in the Application Sections 4.2.2, 6.5.1 and 6.5.3 of this decision document. Permit conditions 2.3.1, table S1.2, 3.1.1, 3.1.2 and table S3.2
33	Techniques to reduce water usage and prevent or reduce waste water	Measures described in the Application. Sections 4.2.2 and 4.3.8 of this decision document Permit conditions 1.3.1, 2.3.1, table S1.2
34	Reduce emissions to water from FGC and/or from treatment or storage of bottom ashes. BAT AELs	Not applicable

BAT conclusion	Criteria	Delivered by
35	Handle and treat bottom ashes separately from FGC residues	Permit condition 2.3.15
36	Techniques for treatment of slags and bottom ashes	No treatment carried out on site
37	Techniques to prevent or reduce noise emissions.	Measures are described in the Application. Section 6.5.5 of this decision document. Permit conditions 2.3.1, table S1.2, 3.5.1, 3.5.2

ANNEX 2: Pre-Operational Conditions

Based on the information on the Application, we consider that we do need to impose pre-operational conditions. These conditions are set out below and referred to, where applicable, in the text of the decision document. We are using these conditions to require the Operator to confirm that the details and measures proposed in the Application have been adopted or implemented prior to the operation of the Installation.

Table S1.4 Pre-operational measures	
Reference	Pre-operational measures
PO1	Prior to the commencement of commissioning, the Operator shall send: • A summary of the site Environment Management System (EMS);and • A copy of the full OTNOC management plan which shall be prepared in accordance with BAT 18 of the BAT conclusions to the Environment Agency and obtain the Environment Agency's written approval to the EMS summary and the full OTNOC management plan. The Operator shall make available for inspection all documents and procedures which form part of the EMS. The EMS shall be developed in line with the requirements set out in Environment Agency web guide on developing a management system for environmental permits (found on www.gov.uk) and BAT 1 of the incineration BAT conclusions. The EMS shall include the approved OTNOC management plan. The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit.
PO2	Prior to the commencement of commissioning, the Operator shall send a report to the Environment Agency, and obtain the Environment Agency's written approval to it, which will contain a comprehensive review of the options available for utilising the heat generated, including operating as CHP or supplying district heating, by the waste incineration process in order to ensure that it is recovered as far as practicable. The review shall detail any identified proposals for improving the recovery and utilisation of heat and shall provide a timetable for their implementation.
PO3	Prior to the commencement of commissioning, the Operator shall submit to the Environment Agency, and obtain the Environment Agency's written approval to it, a protocol for the sampling and testing of incinerator bottom ash for the purposes of assessing its hazard status. Sampling and testing shall be carried out in accordance with the protocol as approved.
PO4	Prior to the commencement of commissioning, the Operator shall submit to the Environment Agency, and obtain the Environment Agency's written approval to it, a written commissioning plan, including timelines for completion, for

Table S1.4 Pre-operational measures	
Reference	Pre-operational measures
	approval by the Environment Agency. The commissioning plan shall include the expected emissions to the environment during the different stages of commissioning, the expected durations of commissioning activities and the actions to be taken to protect the environment and report to the Environment Agency in the event that actual emissions exceed expected emissions. Commissioning shall be carried out in accordance with the commissioning plan as approved.
PO5	No later than one month after the final design of the furnace and combustion chamber, the operator shall submit a written report to the Environment Agency, and obtain the Environment Agency's written approval to it, of the details of the computational fluid dynamic (CFD) modelling. The report shall explain how the furnace has been designed to comply with the residence time and temperature requirements as defined by Chapter IV and Annex VI of the IED whilst operating under normal load and the most unfavourable operating conditions (including minimum turn down and overload conditions), and that the design includes sufficient monitoring ports to support subsequent validation of these requirements during commissioning.
PO6	Prior to the commencement of commissioning, the Operator shall submit a report, and obtain the Environment Agency's written approval to it, on the baseline conditions of soil and groundwater at the installation. The report shall contain the information necessary to determine the state of soil and groundwater contamination so as to make a quantified comparison with the state upon definitive cessation of activities provided for in Article 22(3) of the IED. The report shall contain information, supplementary to that already provided in application Site Condition Report, needed to meet the information requirements of Article 22(2) of the IED.
PO7	At least three months before (or other date agreed in writing with the Environment Agency) the commencement of commissioning, the Operator shall submit a written report to the Environment Agency, and obtain the Environment Agency's written approval to it, specifying arrangements for continuous and periodic monitoring of emissions to air to comply with Environment Agency guidance notes M1, M2 and M20. The report shall include the following: • Plant and equipment details, including accreditation to MCERTS • Methods and standards for sampling and analysis • Details of monitoring locations, access and working platforms

Table S1.4 Pre-operational measures	
Reference	Pre-operational measures
PO8	At least 3 months before the commencement of commissioning (or other date agreed in writing with the Environment Agency) the Operator shall submit, for approval by the Environment Agency, a methodology (having regard to Technical Report P4-100/TR Part 2 Validation of Combustion Conditions) to verify the residence time, minimum temperature and oxygen content of the gases in the furnace whilst operating under normal load, minimum turn down and overload conditions.
PO9	At least 3 months before the commencement of commissioning the operator shall: • Confirm that the additional noise mitigation measures described in the noise impact assessment have been implemented; or • Submit a report, and obtain the Environment Agency's written approval to it, to show that alternative measures have been implemented that provide an equivalent level of overall noise mitigation as the additional measures.
PO10	Prior to the commencement of commissioning, the Operator shall submit a revised fire prevention plan, and obtain the Environment Agency's written approval to it. • Final design location of quarantine areas • Final designs of the systems for the provision and containment of firewater are confirmed via a pre-operational condition. The operator shall implement the fire prevention plan as approved by the environment Agency.
PO11	At least a month prior to commissioning the operation shall confirm in writing to the Environment Agency the final chosen MWth for the Backup electrical generator activity AR3 as referenced in Table S1.1.

ANNEX 3: Improvement Conditions

Based in the information in the Application we consider that we need to set improvement conditions. These conditions are set out below - justifications for these is provided at the relevant section of the decision document. We are using these conditions to require the Operator to provide the Environment Agency with details that need to be established or confirmed during and/or after commissioning.

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
IC1	The Operator shall submit a written report to the Environment Agency on the implementation of its Environmental Management System (EMS) and the progress made in the certification of the system by an external body or if appropriate submit a schedule by which the EMS will be certified.	Within 12 months of the completion of commissioning.
IC2	The Operator shall submit a written proposal to the Environment Agency to carry out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air from emission point A1 and A2 , identifying the fractions within the PM_{10}, and $PM_{2.5}$ ranges. On receipt of written approval from the Environment Agency to the proposal and the timetable, the Operator shall carry out the tests and submit to the Environment Agency a report on the results.	Within 6 months of the completion of commissioning.
IC3	The Operator shall submit a written report to the Environment Agency on the commissioning of the installation. The report shall summarise the environmental performance of the plant as installed against the design parameters set out in the Application. The report shall also include a review of the performance of the facility against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions and confirm that the Environmental Management System (EMS) has been updated accordingly.	Within 4 months of the completion of commissioning.
IC4	The operator shall notify the Environment Agency of the proposed date(s) that validation testing is planned for.	Notification at least 3 weeks prior to validation testing
	During commissioning the operator shall carry out validation testing to validate the residence time, minimum temperature and oxygen	Validation tests completed before the end of

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
	content of the gases in the furnace whilst operating under normal load and most unfavourable operating conditions. The validation shall be to the methodology as approved through pre-operational condition PO8.	commissioning
	The operator shall submit a written report to the Environment Agency on the validation of residence time, oxygen and temperature whilst operating under normal load, minimum turn down and overload conditions. The report shall identify the process controls used to ensure residence time and temperature requirements are complied with during operation of the incineration plant	Report submitted within 2 months of the completion of commissioning.
IC5	The Operator shall submit a written report to the Environment Agency describing the performance and optimisation of: • The lime injection system for minimisation of acid gas emissions • The carbon injection system for minimisation of dioxin and heavy metal emissions. • The Selective Non Catalytic Reduction (SNCR) system and combustion settings to minimise oxides of nitrogen (NOx). The report shall include an initial assessment of the level of NOx, N_2O and NH_3 emissions that can be achieved under optimum operating conditions.	Within 4 months of the completion of commissioning.
	The operator shall carry out a further assessment of the performance of the SNCR system and submit a written report to the Environment Agency on the feasibility of complying with an emission limit value (ELV) for NOx of 100 mg/Nm^3 as a daily average, including a description of any relevant cross-media effects identified. If an ELV for NOx of 100 mg/Nm^3 as a daily average is determined not to be feasible, the report shall propose an	Within 12 months of the completion of commissioning

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
	alternative ELV which would provide an equivalent level of NOx reduction on a long-term basis such as an annual mass emission limit or percentile-based ELV.	
IC6	The Operator shall carry out an assessment of the impact of emissions to air of the *following* component metals subject to emission limit values: Cd, As, Cr, Ni A report on the assessment shall be made to the Environment Agency. Emissions monitoring data obtained during the first year of operation shall be used to compare the actual emissions with those assumed in the impact assessment submitted with the Application. An assessment shall be made of the impact of each metal against the relevant ES. In the event that the assessment shows that an environmental standard can be exceeded, the report shall include proposals for further investigative work.	15 months from the completion of commissioning
IC7	The Operator shall submit a written summary report to the Environment Agency to confirm that the performance of Continuous Emission Monitors for parameters as specified in Table S3.1 and Table S3.1(a) complies with the requirements of BS EN 14181, specifically the requirements of QAL1, QAL2 and QAL3. The report shall include the results of calibration and verification testing,	Initial calibration report to be submitted to the Agency within 3 months of completion of commissioning. Full summary evidence compliance report to be submitted within 18 months of completion of commissioning.
IC8	During commissioning, the operator shall carry out tests to demonstrate whether the furnace combustion air will ensure that negative pressure is achieved throughout the reception hall. The tests shall demonstrate whether air is pulled through the reception hall	Within 3 months of completion of commissioning.

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
	and bunker area and into the furnace with dead spots minimised. The operator shall submit a report to the Environment Agency, for approval, summarising the findings along with any proposed improvements if required	
IC9	The operator shall carry out a programme of dioxin and dioxin like PCB monitoring over a period and frequency agreed with the Environment Agency. The operator shall submit a report to the Environment Agency with an analysis of whether dioxin emissions can be considered to be stable.	Within 3 months of completion of commissioning or as agreed in writing with the Environment Agency
IC10	The operator shall carry out a programme of mercury monitoring over a period and frequency agreed with the Environment Agency. The operator shall submit a report to the Environment Agency with an analysis of whether the waste feed to the plant can be proven to have a low and stable mercury content.	Within 3 months of completion of commissioning or as agreed in writing with the Environment Agency
IC11	The Operator shall submit a report to the Environment Agency for approval on start-up and shut-down conditions over the first 12 months of operation. The report shall identify any amendments to the start-up and shut-down definitions that were described in the application.	Within 15 months of completion of commissioning or as agreed in writing with the Environment Agency
IC12	During commissioning, the operator shall carry out tests to assess whether the air monitoring location(s) meet the requirements of BS EN 15259 and supporting Method Implementation Document (MID). A written report shall be submitted for approval setting out the results and conclusions of the assessment including where necessary proposals for improvements to meet the requirements. The report shall specify the design of the ports for PM10 and PM2.5 sampling. Where notified in writing by the Environment	Within 3 months of completion of commissioning

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
	Agency that the requirements are not met, the operator shall submit proposals or further proposals for rectifying this in accordance with the time scale in the notification. The proposals shall be implemented in accordance with the Environment Agency's written approval.	

ANNEX 4: Consultation Reponses

A) Advertising and Consultation on the Application

The Application has been advertised and consulted upon in accordance with the Environment Agency's Public Participation Statement. The way in which this has been carried out along with the results of our consultation and how we have taken consultation responses into account in reaching our draft decision is summarised in this Annex. Copies of all consultation responses have been placed on the Environment Agency public register.

The Application was advertised on the Environment Agency website from 1*st March 2021* to 29th March 2021 and in the Leicester Mercury and Nottingham Post on *1st March 2021*. The Application was made available to view at the Environment Public Register at Trentside offices, Scarrington Road, West Bridgford, Nottingham, NG2 5BR.

The following statutory and non-statutory bodies were consulted: -

- Local Authority planning – Nottinghamshire County Council
- Local Authority Environmental Health – Nottinghamshire County Council
- Food Standards Agency
- Civil Aviation Authority
- National Grid
- Health and Safety Executive
- Fire & Rescue service
- Director of Public Health & Public Health England

1) Consultation Responses from Statutory and Non-Statutory Bodies

Response Received from Public Health England	
Brief summary of issues raised:	Summary of action taken / how this has been covered
Recommendations • Reduce public exposures to non-threshold pollutants (such as particulate matter and nitrogen dioxide) below air quality standards has potential public health benefits. • We support approaches which minimise or mitigate public exposure to non-threshold air pollutants and address inequalities (in exposure) and encourage their consideration during site design, operational	The applicant has demonstrated through air dispersion modelling and human health risk assessments that air emissions will not result in a significant impact on air quality and that emissions will not exceed air quality standards. Refer to sections 5.2 and 5.3 of this document for further information. The operator has demonstrated that they intend to implement site design and pollution control measures in line with best available techniques for industry as outlined in our guidance

management, and regulation. • This consultation response is based on the assumption that the permit holder shall take all appropriate measures to prevent or control pollution, in accordance with the relevant sector guidance and industry best practice.	and the sector BAT conclusions. They will also comply with air quality standards and BREF BAT conclusion air emission limits. The permit contains limits to ensure that emissions do not breach air quality standards, emission are in line with BAT for the sector and that appropriate measures will be implemented.

Response Received from Health and Safety Executive	
Brief summary of issues raised:	Summary of action taken / how this has been covered
No comments.	N/A

Response Received from Nottinghamshire County Council	
Brief summary of issues raised:	Summary of action taken / how this has been covered
We are aware that there have been issues regarding ash and dust management but that these have been investigated and action taken to address them. We would support on-going monitoring and management of dust and noise at this site and would welcome assurance that all relevant industry standards are monitored and maintained. We note and support the response from the CRCE at Public Health England and endorse their recommendation regarding the reduction of exposure to pollutants to below air quality standards.	The applicant has demonstrated that the plant will be designed in line with our guidance and BAT conclusions for the sector and that the site will implement best available techniques to prevent significant dust and noise emissions. This includes covered delivery of waste and storage in a bunker within a building. Please refer to section 6.5.3 for further information Please see our response to the PHE recommendation above.

2) Consultation Responses from Members of the Public and Community Organisations

The consultation responses received were wide ranging and a number of the issues raised were outside the Environment Agency's remit in reaching its permitting decisions. Specifically questions were raised which fall within the jurisdiction of the planning system, both on the development of planning policy and the grant of planning permission.

Guidance on the interaction between planning and pollution control is given in the National Planning Policy Framework. It says that the planning and pollution control systems are separate but complementary. We are only able to take into account those issues, which fall within the scope of the Environmental Permitting Regulations.

a) Representations from Local MP, Councillors and Parish / Town / Councils

No responses received

b) Representations from Community and Other Organisations

No responses received

c) Representations from Individual Members of the Public

A total of 7 of responses were received from individual members of the public. Many of the issues raised were the same as those considered above. Only those issues additional to those already considered are listed below:

Response Received from Individual Members of the Public	
Brief summary of issues raised:	Summary of action taken / how this has been covered
Concern over impacts on ecological sites.	We are satisfied that there will not be a significant impact on ecological sites. Section 5.4 of this decision document has further details.
Concern recyclables are being diverted to feed energy from waste plants. Concern the proposal does not promote recycling and minimisation of waste and therefore does not promote resource efficiency and reuse waste as a resource.	The obligation is on waste producers to apply the waste hierarchy and for local authorities to have their own waste strategy dealing with kerbside collections. Our role in this determination is to assess whether any residual waste that may be sent for incineration can be dealt with in an environmentally acceptable manner.

Concern that this does not Adhere to the 70% recycling target in Nottinghamshire's Waste Local Plan	The proposed facility forms part of an integrated waste management strategy; any material arriving at the facility will be residual waste arising following upstream waste segregation, recovery and recycling initiatives. The shape and content of this strategy is a matter for the Local Authority. The incinerator is one element in that strategy, and the Permit will ensure that it can be operated without giving rise to significant pollution or harm to human health or the environment. In any event, Permit conditions will prohibit the burning of any separately collected or recovered waste streams, unless contaminated and recovery is not practicable. We have set permit condition 2.3.4 (c) that does not allow separately collected fractions to be incinerated unless they are unsuitable for recycling.
Concern application fails to consider the effect of biostabilisation of waste prior to landfill.	The implementation of additional pre-treatment techniques to reduce the impact of some landfill wastes does not result in a significant enough benefit to suggest disposal of waste to landfill would become favourable over disposal of waste via incineration when considering overall environmental impact. Therefore the acknowledgement of the landfill waste pre-treatment techniques is not required. The EA is required to assess the environmental impact of the proposed activity not activities that have not been proposed.
Concerns regarding carbon dioxide emissions and climate change. Concern regarding delivering net zero carbon emissions by 2050.	Our assessment of global warming is covered in sections 6.3 and 6.6 of this decision document. The Government's current Waste Strategy ('Our Waste, Our Resources: a Strategy for England', December 2018 and Waste Management Plan for England 2021) do not exclude waste incineration with energy recovery as an acceptable

	waste management option. Incineration currently plays a significant role in waste management in the UK and the Government expects this to continue. Defra's current view is that waste incineration is the best management option for waste that cannot be prevented, reused or recycled and that it plays an important role in diverting waste from landfill, reducing its environmental impact.
Concern that the carbon dioxide produced per kWh is worse than burning coal and gas, there more waste than coal has to be burnt to get the same amount of energy, meaning more pollutants are released.	Comparison to coal fired power station is not considered relevant because the processing of coal has the primary purpose of producing energy which is different to the role incinerators play in managing the disposal of waste and recovering energy from it. In any event, the EA is required to assess the environmental impact of the proposed activity not activities that have not been proposed.
Concern regarding the applicant stating that only the non-biogenic carbon should be considered. No difference between fossil fuel CO2 and non-fossil fuel CO2	The applicant has used non-biogenic and biogenic as a comparison to show, when compared to fossil fuel burning processes, the energy from waste plant processes a larger amount of biogenic (short term carbon stores where current atmospheric carbon which has recently been stored). The energy produced from fossil fuels however is non-biogenic (e.g from fossil fuel long term carbon storage/sinks). Using Non-biogenic fuels such as fossil fuels releases carbon from long term carbon sinks. This has a greater impact on total atmospheric carbon as the source has removed no current atmospheric carbon it only contributes more carbon that was locked away in carbon sinks. This therefore has more of an impact on climate change.

Concern there is no carbon capture	Carbon capture technology is not yet an available technology for energy from waste sites particularly of this size. We require combustion plants that generate 300 MW or more electricity to be carbon capture ready. This Installation is well below this level.
Concerns regarding heavy road traffic bringing in the waste to the site. Concern regarding congestion of nearby roads. Concern this will mean increased traffic, air pollution. Requiring waste to be trucked across the greenbelt.	The export/import of waste is not an issue controlled under the Environmental Permitting Regulations. It is a consideration of the local planning authority in accordance with its Local Waste Strategy/Plan. Decisions over transport infrastructure are matters for the planning system and Highways Agency. They are not covered under the Environmental Permitting Regulations. The air quality assessment considered existing background pollution levels which includes emissions from traffic. Movement of traffic to and from the Installation is outside of our remit but will normally be an issue for the planning authority to consider. Our consideration is whether the emissions from traffic could affect the prevailing pollutant background levels which could be a consideration where there are established high background concentrations contributing to poor air quality. In this case the small increase in pollutants from traffic would not affect the background levels to the point where it would affect the conclusions of the air quality assessment. Vehicle movements within the Installation boundary are considered within the remit of the Environmental Permit. The emissions from this limited area are highly unlikely to be significant and will not affect the conclusions of the air quality impact assessment.

Concerns regarding dust emissions	The proposal to mitigate dust and heavy metals are bag filters which are current abatement techniques used by modern waste incinerators) that are effective at removing at least 99% of all fine particle sizes. Accordingly, we believe at this level of performance the concentration of particulates actually emitted from the stack will be extremely low and therefore not associated with any significant risk to health and the local community. We are satisfied that the Installation will not have a significant impact on health or the environment due to particulates. Impacts from particulates are covered in detail in sections 5.2 and 5.3.3. In regard to fugitive dust emissions, based upon the information in the application we are satisfied that appropriate measures will be in place to prevent and /or minimise fugitive dust emissions, this is covered in section 6.5.3
The energy efficiency of most modern EFW plants is poor at somewhere between 15% and 30% and this plant is not currently planning on implementing a combined heat and power system	Incinerators play in a role in managing the disposal of waste and recovering energy from it and the stated energy efficiency for this plant is 31.1% with potential for further improvements. This is within the top end of the BAT AEL range. Combined heat and power system are not determined to be viable at present but the operator is required to reassess its viability as the area is developed and more opportunities arise. We are satisfied there are measures in place to develop combined heat and power once a proposal becomes viable. Refer to section 4.3.7 of this decision document for further information
Concern there is no appraisal of costs, or of energy losses in distribution, or of the consequential reduction in electricity production.	The offsite distribution of electricity is not an issue controlled under the Environmental Permitting Regulations. The applicant has

	demonstrated their energy efficiency is in line the BAT AEL range and have also assessed the viability of combined heat and power. Refer section 4.3.7 on energy efficiency.
Health impacts Concern poor air quality in Nottingham, a cause of early mortality. Concerns air emissions are harmful to the environment, local villages and Nottingham city.	The impact on air quality has been assessed and we have audited the assessment. We are satisfied that the Installation will not have a significant impact on health or the environment. Defra's current view is that waste incineration is the best management option for waste that cannot be prevented, reused or recycled and that it plays an important role in diverting waste from landfill, reducing its environmental impact. When assessing an Application for an environmental permit, our priority is to ensure that the proposed Installation will be designed and operated without posing a significant risk to the environment and the health of local people. Before we consider issuing a permit, the Applicant must demonstrate that the proposed Installation will meet all the legal requirements, including environmental, technological and health requirements. In this instance, we have considered all the relevant factors including representations received from our consultation and that emissions from the site are well below the air quality standards and will not cause any exceedance. We have reached the decision that the proposals would not give rise to any significant pollution of the environment or harm to human health. This is covered in detail in section 5.2, 5.3 and 6 of this decision document.
Concern there is already sufficient capacity for waste incineration locally and that waste destined for incineration is only going to decrease	The need to maintain the incinerator at full capacity is primarily a matter for the Applicant. Our remit is to ensure the site operates in line with BAT and

if the local waste strategy targets are to be met, so building this incinerator will necessarily mean that waste will need to be transported in from far and wide to feed the incinerator.	is not causing an impact when incinerating waste. The proposed facility forms part of an integrated waste management strategy; any material arriving at the facility will be residual waste arisings following upstream waste segregation, recovery and recycling initiatives. The shape and content of this strategy is a matter for the local authority. The incinerator is one element in that strategy, and the Permit will ensure that it can be operated without giving rise to significant pollution or harm to human health or the environment.
The calorific value of the general waste stream going to incineration and EFW is likely to diminish as new technologies recover the waste.	
This is a green belt area and should be developed to decrease environmental impact not increase it. Concern the site is miles away from the main urban areas where most waste is generated.	Decisions over land use are matters for the planning system. The location of the installation is a relevant consideration for Environmental Permitting, but only in so far as its potential to have an adverse environmental impact on communities or sensitive environmental receptors. The environmental impact is assessed as part of the determination process and has been reported upon in the main body of this document.

B) Advertising and Consultation on the Draft Decision

This section reports on the outcome of the public consultation on our draft decision carried out between 06/01/2022 and 03/02/2022.

In some cases the issues raised in the consultation were the same as those raised previously and already reported in section A of this Annex and so have not been repeated in this section.

Also some of the consultation responses received were on matters which are outside the scope of the Environment Agency's powers under the Environmental Permitting Regulations. Our position on these matters is as described previously.

a) Consultation Responses from Statutory and Non-Statutory Bodies

No comments were received.

b) Representations from Local MP, Assembly Member (AM), Councillors and Parish / Town / Community Councils

No comments were received.

c) Representations from Community and Other Organisations

No comments were received.

d) Representations from Individual Members of the Public

A total of 3 of responses were received from individual members of the public. These raised many of the same issues as previously addressed. Only those issues additional to those already considered above are listed below:

Responses Received from Individual Members of the Public	
Brief summary of issues raised:	Summary of action taken / how this has been covered
Where will the waste come from?	The sourcing of waste is not an issue controlled under the Environmental Permitting Regulations and is not considered as part of this permit application. It is a consideration of the local planning authority in accordance with its Local Waste Strategy/Plan.
Does the incinerator produce energy and how?	Hot gases from the furnace will pass to a boiler which converts the energy from the gases into steam. Superheated steam is piped from boilers to the steam turbines that power a generator to generate electricity.
Why permit incinerators when recycling rates are increasing.	The proposed facility forms part of an integrated waste management strategy; any material arriving at the facility will be residual waste arising following upstream waste segregation, recovery and recycling initiatives. The shape and content of this strategy is a matter for the Local Authority. Our role in this determination is to assess whether any residual waste that may be sent for incineration can be dealt with in an environmentally acceptable manner.
Concern regarding carbon footprint of the building.	The structural design and materials used to construct the facility are a concern for the Planning Authority or Building Regulation control. We are concerned with the control of emissions from the incineration process during operation.
Why have emissions from increased road transportation not been modelled?	Offsite traffic movements and associated emissions are the responsibility of the Local Authority. Our remit covers emissions from onsite traffic and whether the emissions could affect the prevailing pollutant background levels. This could be a consideration where there are

	established high background concentrations, contributing to poor air quality. In this case the small increase in pollutants from site traffic would not affect the background levels to the point where it would affect the conclusions of the air quality assessment.
Why is the coal fired power station closing on environmental grounds only to be replaced by an incinerator?	Comparison to coal fired power station is not considered relevant because the processing of coal has the primary purpose of producing energy which is different to the role incinerators play in managing the disposal of waste and recovering energy from it. Also in regards to decommissioning, the power station is closing in line with government policy and tightening legislation limits. The proposed incinerator can comply with the relevant legislation limits and is in line with government strategy for waste management.
Cumulative effect multiple incinerators in local area.	The Applicant's air quality modelling takes into account the existing air quality background. We have assessed the Applicant's modelling and we are satisfied there will be no significant impact on human health or the environment. Refer to section 5.2 for further information.
Particulates and ultrafine particles.	We have assessed the Applicant's proposals alongside their air quality modelling and we are satisfied that the particulate matter process contribution (PM_{10} and $PM_{2.5}$) from the proposed Installation is predicted to be less than 1% of the long-term environmental standard at the point of maximum impact. The Permit also specifies the continuous monitoring of total particulate matter in accordance with Part VI of the IED We are therefore satisfied that the Installation will not have a significant impact on health due to particulates. Impacts from particulates are covered in detail in sections 5.2 and 5.3.3.
Wales memorandum on incineration to allow more time and research.	Defra's current view is that waste incineration is the best management option for waste that cannot be

	prevented, reused or recycled and that it plays an important role in diverting waste from landfill, reducing its environmental impact.
Concerns no discussion of CO_2 mitigation in the consultation documents.	The production of CO_2 is minimised through maximising energy efficiency and from using wastes to support the export of electricity to the public supply instead of burning of virgin fuels. Carbon capture technology is not yet an available technology for energy from waste sites particularly of this size. We require combustion plants that generate 300 MW or more electricity to be carbon capture ready. This Installation is well below this level. Refer to section 6.3 and 6.6. for further information
Concerns acid and nitrogen release will affect plant life and natural ecosystems.	We have assessed the Applicant's air modelling and are satisfied that emissions such as acid deposition and nitrogen will not significantly impact habitat and conservation sites. Refer to section 5.4 for further information.
Why is wildlife outside a SSSI not assessed?	Thresholds for SAC, SPA and SSSI features are more stringent than those for other nature conservation sites. Therefore we would generally conclude that the Installation is not causing significant pollution at these other sites if they not impacting on the more sensitive sites. Refer to section 5.4.4 for further information.
Impact of ecological pollutants on human health.	The applicant has assessed their emissions against the relevant air quality standards which have been specifically developed for both human health and the ecological receptors based on the significance of their impact. We are satisfied that the operator has carried out their assessment based on the appropriate air quality standards which apply to human health.