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/SP3206ST
The Applicant / Operator is:	WTI/EFW HOLDINGS LIMITED
The Installation is located at:	Kemsley, Sittingbourne, Kent

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/SP3206ST/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/SP3206ST. We refer to the permit as "the **Permit**" in this document.

The Application was duly made on 08 October 2020.

The Applicant is WTI/EFW HOLDINGS LIMITED. We refer to WTI/EFW HOLDINGS 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 WTI/EFW HOLDINGS LIMITED "the **Operator**".

WTI/EFW HOLDINGS LIMITED's proposed facility is located at Kemsley, Sittingbourne in Kent. 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
- 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 responses

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
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
CCW	Countryside Council for Wales
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
CW	Clinical waste
CWI	Clinical waste incinerator
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)
IPPCD	Integrated Pollution Prevention and Control Directive (2008/1/EC) – now superseded by IED
I-TEF	Toxic Equivalent Factors set out in Annex VI Part 2 of IED
I-TEQ	Toxic Equivalent Quotient calculated using I-TEF
LCPD	Large Combustion Plant Directive (2001/80/EC) – now superseded by IED
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
SED	Solvent Emissions Directive (1999/13/EC) – now superseded by IED
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 them 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 08 October 2020. 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 made a copy of the Application and all other documents relevant to our determination (see below) available to view on our Public Register at Alchemy House, Bessemer Road, Welwyn Garden City, Hertfordshire, AL7 1HE. Anyone wishing to see these documents could do so and arrange for copies to be made. Documents were also available to view on-line together with the facility to provide consultation comments electronically.

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

- Natural England
- Local Authority Environmental Protection Department
- Local Planning Authority / Marine Management
- National Infrastructure Planning
- Food Standards Agency
- Health and Safety Executive
- Public Health England and the relevant Director of Public Health
- Local Fire Service

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.

Further details along with a summary of consultation comments and our response to the representations we received can be found in Annex 4 of this document. 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 as set out below. 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 as set out below. We made a copy of this information available to the public in the same way as the responses to our information notices.

Information request	**Response**
Additional information received 13 October 2020	Waste throughput and basis of impact assessments
Request for further information (Schedule 5 Notice) dated 21 October 2020	Response received 05 November 2020 Air quality (human health & habitats), abnormal operation, SNCR vs SCR and energy efficiency
Request for further information by email sent 26 October 2020	Response received 05 November 2020 Noise
Request for further information by email sent 10 November 2020	Response received 25 November 2020 Schedule 5 Notice response clarification and storage arrangements.
	Response received 27 November 2020 Energy Efficiency Directive
Request for further information (Schedule 5 Notice) dated 09 December 2020	Response received 17 December 2020 Impact on The Swale SPA, Ramsar and SSSI
Additional information received 13 January 2021	Mercury monitoring frequency
Replacement application report	Updated permit application report, version 5 dated and received 28 January 2021 Replaces previous submission dated 30 July 2020

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 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 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 facility will be located at national grid reference TQ 92160 66730, on land immediately north of the permitted Kemsley Generating Station (GS) (permit number EPR/JP3135DK). To the west of the site is the Kemsley Paper Mill (permit number EPR/BJ7468IC).

The Paper Mill has a significant steam demand as well as requiring electricity to power the process. The Kemsley GS is to help meet the steam demand. This facility will only generate steam for the Paper Mill in cases when the Kemsley GS is unable to meet the required demand. Under these circumstances steam will be provided to the Kemsley GS from where it will be supplied to the Paper Mill via the Kemsley GS steam supply connection.

Steam raised in the boiler will usually be passed to a single steam turbine to generate electricity which will be used on-site and exported to the National Grid.

The facility is within the screening distance of a number of statutory and non-statutory ecological sites which include:

The Swale Special Protection Area (SPA), Ramsar and Site of Special Scientific Interest (SSSI), Medway estuary and marshes SPA and Ramsar, Thames estuary and marshes SPA and Ramsar, Outer Thames estuary SPA, Queendown Warren Special Area of Conservation (SAC) and two local wildlife sites.

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 section 4.3.

4.1.3 What the Installation does

The Applicant has described the facility as Energy from Waste (EfW). 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 never the less 'incineration' because it is considered that its main purpose is the thermal treatment of waste.

The facility will comprise a single line capable of processing up to 390,000 tonnes of waste per annum. All waste will be delivered by road to the waste bunker following waste acceptance procedures. The waste bunker has a capacity equating to approximately 8,000 tonnes of waste material.

The materials to be burned will comprise treated non-hazardous waste materials namely: municipal solid waste (MSW), commercial and industrial waste (C & I) which includes solid residues from the Paper Mill and solid recovered fuel (SRF).

Waste material is transferred from the bunker via an overhead gantry crane into the waste charging hopper. The charging hopper connects into a feed chute from where a hydraulically driven ram feeder is used to evenly distribute the charge along its extent and transport it to the grate area. Moving grate technology will be used for burning waste material.

The combustion stage will be automatically controlled to ensure optimum destruction of pollutants and minimum waste generation. Primary combustion air will be fed into the furnace through the underside of the grates and secondary air will be injected at high velocity through nozzles positioned in the walls of the combustion chamber above the level of the waste.

Back-up burners using fuel-oil will be located above the grate. The burners will be automatically triggered to ensure that the minimum temperature of 850°C is maintained.

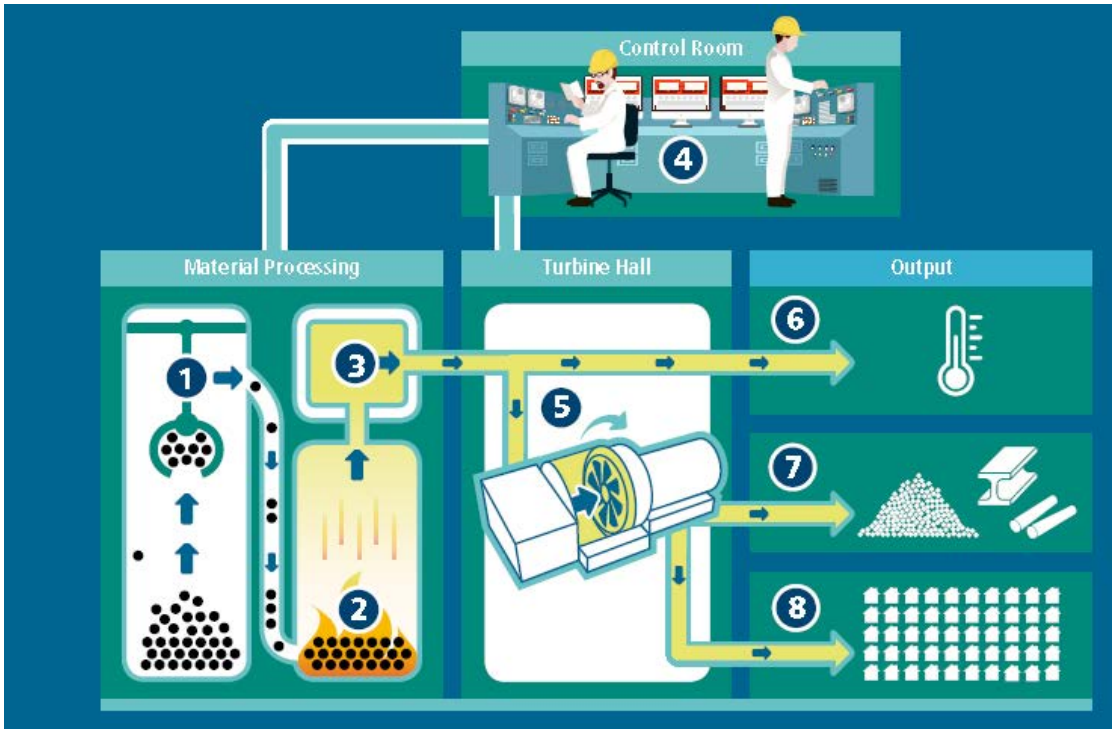
Energy is recovered from the hot flue gases within the steam boiler. Hot gases from the furnace will pass into the boiler section where steam will be raised. Steam raised in the 135 MWth boiler will usually be passed to a single steam turbine to generate electricity which will be used on-site (up to 5 MWe) and exported to the National Grid (up to 37 MWe) with a generating capacity of up to 42 MWe. Occasionally, some steam (at intermediate pressure) will be exported via the steam supply system to Kemsley GS and then to the Paper Mill. This will happen when Kemsley GS cannot provide the required steam demand.

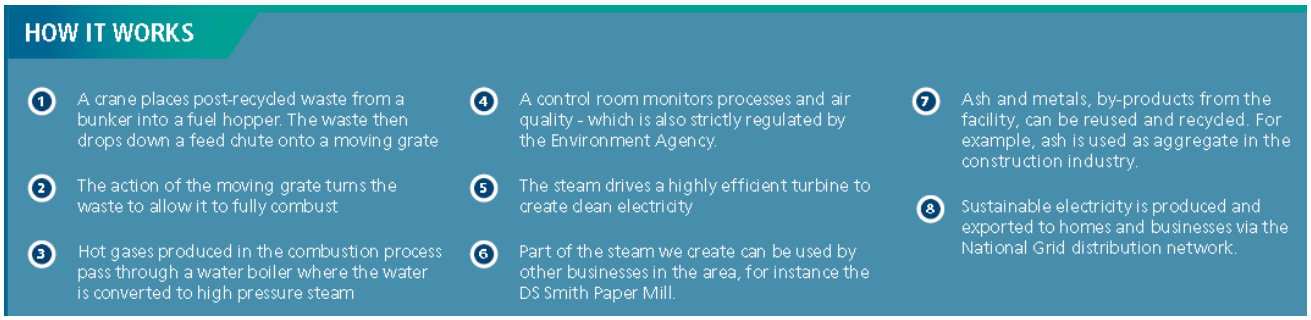
Abatement and controls are in place to ensure that releases to air are controlled below the limits specified within the IED and the incineration BAT conclusions. These are selective non-catalytic reduction (SNCR), dry sorption reactor with hydrated lime and activated carbon injection, fabric bag filter and boiler design. Flue gases exiting the abatement system will be discharged through a 90 m stack.

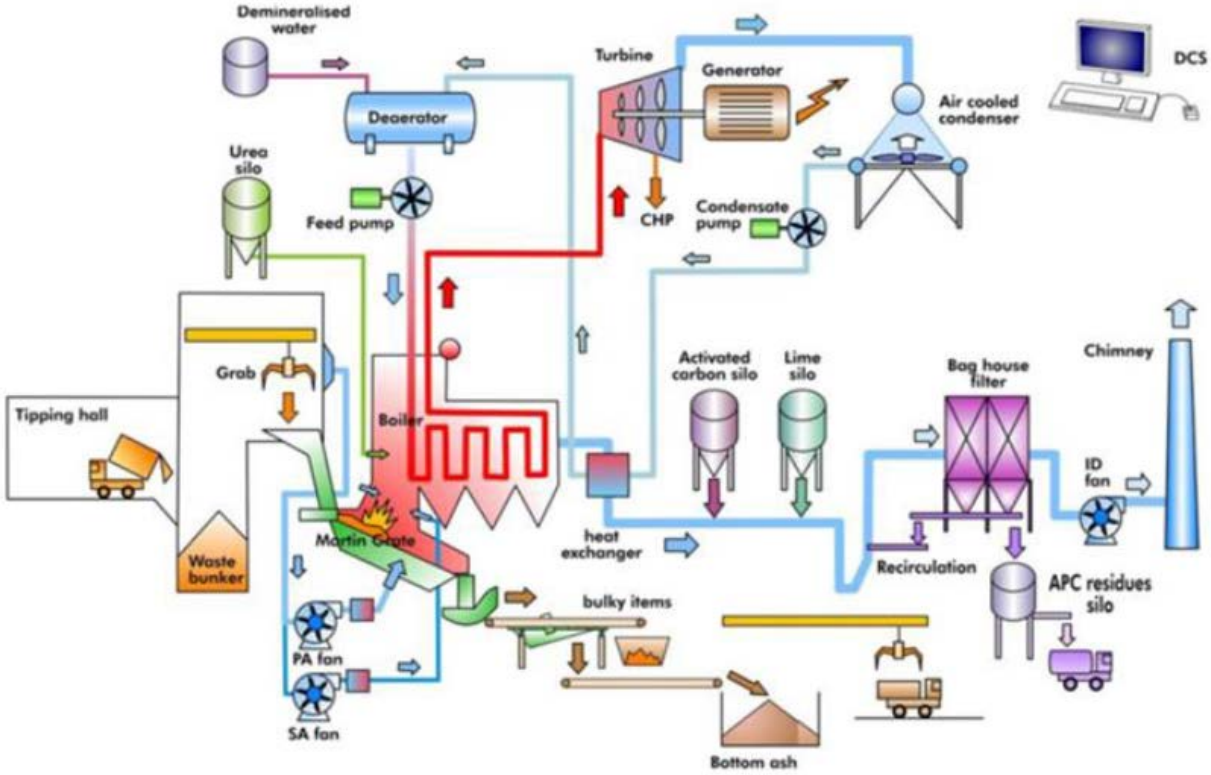
The facility has been designed to minimise fresh water consumption by maximising the re-use of process waters and through the collection of rainwaters.

The main solid residues will be bottom ash and air pollution control (APC) residues. Both will be transferred off-site by a third party for treatment or disposal in accordance with duty of care requirements.

An environmental management system will be established and certified in accordance with the requirements of the ISO14001 standard.







The key features of the Installation can be summarised in the table below, based on 8,200 hours of operation per year.

Waste throughput, Tonnes/line	390,000 tonnes/annum	47.56 tonnes/hour
Waste processed	MSW, C & I, SRF	
Number of lines	1	
Furnace technology	Grate	
Auxiliary Fuel	Low sulphur fuel oil	
Acid gas abatement	Dry	Hydrated lime
NOx abatement	SNCR	Ammonia or urea
Reagent consumption	Auxiliary fuel: 260 tonnes/year Urea : 750 tonnes/year (ammonium hydroxide to be confirmed should ammonia be used instead of urea) Hydrated lime: 5,800 tonnes/year Activated carbon: 140 tonnes/year Process water: 63,000 m^3/year	
Flue gas recirculation	No	
Dioxin abatement	Activated carbon	
Stack	592043, 166710	
	Height, 90 m	Diameter, 4.0 m
Flue gas	Flow, 137.5 Nm^3/s	Velocity, 15.3 m/s
	Temperature 130 °C	

Electricity generated (electricity only mode)	42 MWe	344,400 MWh
Electricity exported (electricity only mode)	37 MWe	303,400 MWh
Electricity used on-site	5 MWe	
Steam exported	70 tonnes/hour, 230 ^{o}C (max. 560 hours/year)	Pressure, 11 bar/MPa 51.9 MWth

4.1.4 Key issues in the determination

The key issue arising during this determination was the impact on The Swale SPA, Ramsar and SSSI and we therefore describe how we determined this issue in most detail in this document.

4.2 The site and its protection

4.2.1 Site setting, layout and history

The proposed development site is located to the east of the existing Kemsley Paper Mill, Sittingbourne, Kent. The topography of the site and surrounding area is generally flat with an elevation of approximately 5 to 6 metres above ordnance datum (mAOD).

The site is split into three areas and comprises an area of marsh land, a stockpile area and a contractor's laydown area. The contractor's laydown area was utilised during the Phase 2 extension to the existing Kemsley GS adjacent to the site. The area of stockpiled material is located in the south-west of the site and is understood to have been generated during the extension.

The Kemsley waste disposal site is located immediately to the south-east comprising a landfill of some 11 hectares in area. The landfill has been used for the disposal of wastes generated by the Kemsley Paper Mill since the commissioning of the mill in 1928. The wastes historically received by the landfill have included general wastes, bark strippings, reject logs and timber, hardboard and hardboard strips, demolition rubble and building materials, mill garden waste and primary effluent sludge cake. More recently, wastes have been limited to general waste (15%), primary/secondary mill effluent sludge cake (4%) and rejected plastics (81%).

4.2.2 Proposed site design: potentially polluting substances and prevention measures

Fugitive releases have been identified and assessed as part of the Environmental Risk Assessment provided as Appendix E of the Application.

Good housekeeping practices will be in operation to ensure that any spillages of potentially dusty materials are cleared up at the earliest opportunity. Spill kits will be available for clean-up of all chemicals (i.e. boiler water treatment chemicals) and oils (i.e. fuel-oil and maintenance oils) stored and used within

the facility and will be located in proximity to the relevant storage areas and/or delivery points. Site procedures will detail those actions which should be followed in the event of a spillage.

Potential fugitive releases to surface water, sewer and groundwater are likely to occur only as a result of an incident or accident.

The incoming waste material storage bunkers will be constructed of concrete and will be impervious. All process areas will be located on hard standing.

All bunds provided for chemical and oil storage tanks will be manually inspected to ensure they remain empty. Bunds will all be designed to contain at least 110% of the contents of the largest storage tank or 25% of the total tankage, whichever is the greater and will be resistant to the material which they are designed to contain. Procedures will be in place for visual inspection of all bunds to ensure they remain free from accumulation of rainwater. Any discharge of rainwater will be tested for pH and visible solids and oil. Should the tests indicate that there is no contamination; the water would be discharged to the outfall and into The Swale. In the event that the water is found to be contaminated the waters would either be treated on site or tankered for off-site disposal.

Underground structures will be limited to: the lower part of the bunker; site drains; drainage sumps; rainwater tank; firewater/temporary rainwater tank; and incoming clean water systems.

We can conclude that the assessment indicates that the proposed measures for control of fugitive releases will ensure that no significant risks from fugitive releases are expected from the facility.

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 submitted a site condition report which includes a report on the baseline conditions as required by Article 22. We have reviewed that report and consider that it adequately describes the condition of the soil and groundwater prior to the start 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 the process description section of the non-technical summary (Permit Application, report ref JER 1247, dated 31 July 2020) of the Application. Pre-operational condition PO1 requires the Operator to have an Environmental Management System (EMS) 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 EMS that will be in accordance with the requirements of ISO14001. Paragraph 2.1.6 of the Permit Application report dated 31 July 2020 confirms that the EMS will be certified.

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 certification 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. 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 EMS and must be in place prior to commissioning as required by a pre-operational condition (PO1).

The Applicant submitted a Fire Prevention Plan (FPP) which we reviewed. We sent an email to the Applicant 05 November 2020 identifying the deficiencies. We have set a pre-operational condition to address the deficiencies and to allow the Operator time in which to finalise their plan before commencing the activities authorised. The plan must be approved by us prior to commencement of operations.

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	Table 3 – Technical standards, in response to section 3, Part B3 of the Application form Wheelabrator Kemsley North (WKN) Energy from Waste Facility Permit application document, dated 28 January 2021, version 5: Sections 1.1, 1.5, 2.1 to 2.5, 3.1, 3.2, 3.4, 3.5, 3.8 to 3.11, 4.1 to 4.5, 4.7 and Waste Incineration BAT Conclusions 2019. Response to question 3 (IED Chapter IV compliance) of the	IED Chapter IV applies to the facility. The parts of the application included cover the sections in which the following items are described or defined: -the incineration capacity -the waste feed cessation system -start-up and shut-down -temperature monitoring in the combustion chamber -energy recovery from the installation -temperature, oxygen, water vapour and pressure at air release sampling points

	duly making questions, revision 2 dated 08 October 2020.	
Response to Schedule 5 Notice for further information dated 21 October 2020	Response to question 3 – Monitoring under abnormal operations/failure of the CEMs. There will be a duplicate CEMs in place.	-alternative arrangements for CO, TOC and dust monitoring to make use of the relevant IED abnormal operation condition during CEM failure

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 (MSW, C & I and SRF), 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 of the Permit.

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 a mixture of MSW, C & I, and SRF. Some of the waste types that the Applicant requested appeared to be for recyclable material i.e. 15 01 waste codes. The Permit restricts separately collected fractions to those which prove to be unsuitable for recovery:

Permit condition 2.3.4 c) states: Waste shall only be accepted if it having been separately collected for recycling, it is subsequently unsuitable for recovery by recycling.

We have limited the capacity of the Installation to 390,000 tonnes/annum. This is based on the Installation operating 8,200 hours/year at a maximum capacity of 47.56 tonnes/hour. Although the risk assessments were based on continual operation of 8,760 hours/year, the Applicant confirmed that they would not incinerate more than 390,000 tonnes/year.

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 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:

- Air pre-heat is minimised by extracting secondary air from the highest (which is also the warmest) point in the building, making use of natural warming of the air;
- Insulation will be provided to avoid heat losses from relevant plant items such as the main furnace, steam systems etc. The main plant items will be housed within buildings and doors will be kept shut other than for access;
- Energy efficient lighting;
- Design and construction of the facility to avoid uncontrolled air ingress;
- Optimisation of the facility layout to avoid excessive transfer of materials;
- Effective plant maintenance regime to ensure energy efficiency is maintained over time and reduce down time or prolonged outages;
- Use of ion exchange instead of high-pressure membrane filtration for boiler water treatment.

The Application states that the specific energy consumption, a measure of total energy consumed per unit of waste processed, will be 92.5 kWh/tonne. The installation capacity is 390,000 tonnes/year.

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 8.5 MJ/kg. The specific energy consumption in the Application is in line with the BREF.

(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 primarily generate electricity and has been specified to maximise electrical output The Applicant confirmed that 42 MW of electricity produced for an annual burn of 390,000 tonnes, which represents 10.8 MW per 100,000 tonnes/year of waste burned (0.88 MWh/tonne of waste). The Installation is therefore above the indicative BAT range.

The Installation will primarily generate electricity, but will also provide heat in the form of steam to the adjacent Paper Mill. The gross electrical output of the plant will be 27.4 MW with 51.9 MWth heat output.

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

The gross electrical efficiency was calculated as 31.1%. The BAT AEEL for gross electrical efficiency is 25-35% for new plant. The gross electrical efficiency value calculated by the Applicant is at the higher end of the BAT AEEL range.

The gross energy efficiency was calculated as 63.4%. The BAT AEEL for gross energy efficiency is 72-91%.

The gross energy efficiency value calculated by the Applicant is below the BAT AEEL range. The facility has been designed mainly for electricity export and has therefore been optimised for this mode of generation. Supply of steam has been designed as a back-up when the Kemsley GS is not operational. This is not expected to be for longer than 560 hours each year. Whilst in CHP mode the facility does not operate within the BAT AEEL range, it does offer improved efficiency over electricity only mode, and will only operate for short periods in CHP mode.

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 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.

Our CHP-R guidance also states that opportunities to maximise the potential for heat recovery should be considered at the early planning stage, when sites are being identified for incineration facilities.

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 and gaining accreditation under the DEFRA Good Quality CHP Scheme does not form part of the matters relevant to our determination. They are however general indicators that the Installation is achieving a high level of energy recovery.

The Applicant has not presented an R1 calculation with this Application, nor have we received a separate application for a determination on whether the Installation is a recovery or disposal facility.

Note that the availability or non-availability of financial incentives for renewable energy such as the renewables obligation certificates (ROC) and renewable heat incentive (RHI) schemes is not a consideration in determining this Application.

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

The facility will be built as a CHP facility from the outset to supply steam, via Kemsley GS, at an average of 52 MWth for approximately 560 hours to the Kemsley Paper Mill, when the GS is off-line. The facility will be further CHP Ready to allow additional heat export opportunities in the future and include all the on-site infrastructure necessary to connect to a heat distribution network with minimum modification, by virtue of steam capacity designed into the turbine bleeds and safeguarded space within the turbine hall to house CHP equipment. The Applicant is committed to pursuing additional heat export opportunities by contacting potential heat users and undertaking further development work.

The facility is designed to be ready, with minimum modification, to supply additional heat in the future over and above the steam export to the Paper Mill. The Applicant concludes that it therefore exceeds the requirement for 'CHP ready' (i.e. developed with infrastructure in place).

The Applicant carried out a search of opportunities to supply heat within 10 km of the facility. The heat demand was predominantly from the domestic sector at 75.68 %. In most cases, existing domestic buildings are unsuitable for inclusion in a heat network as a result of the prohibitive costs of replacing existing heating infrastructure and connecting multiple smaller heat consumers to a network.

The large and small industrial sectors contribute 9.26 % and 7.79 % of the local heat demand respectively. The facility is located in close proximity of many industrial estates with warehouses and industrial units. An investigation has been focused on the users within these industrial estates in order to secure the most economically viable heat network.

They have concluded that operating the facility as a high-efficiency cogeneration Installation will not be technically feasible, with the exception of the steam supply to the Kemsley Paper Mill. Physical constraints imposed by the local infrastructure and topology have a significant impact on which loads can viably be connected. River and rail crossings would be required which are technically challenging and may obstruct the most direct route to the consumer. The pipe would also have to be routed around the small towns near each location. This would increase the length of pipe required and consequently increase the cost of the network. The large heat consumer identified is likely to be a steam user and this adds significantly to the technical challenges of supplying heat. Therefore, this large heat user has been discounted. We agree with the conclusions of the assessment.

The Applicant provided a cost-benefit assessment (CBA) of opportunities for high efficiency co-generation within 10 km of the Installation, in which they calculated net present value (NPV). 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 NPV of -£14.79 million 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 at this stage.

The energy efficiency directive (EED) is focussed on the CBA of any CHP opportunities, with a search radius of 15 km. The Applicant's search radius was 10 km. They justified this as follows:

A CBA was carried out as part of the CHP Assessment report for the recent Kemsley GS extension. The potential heat users within 15 km radius of the GS site for the CBA were investigated. One large heat user was identified within the radius search from 10 km to 15 km. It is the Medway Maritime Hospital, which is estimated to require a 19 km pipeline distance from the facility. Heat demand is 23,722 MWh (2.7MW annual average load). The connection would require a rail crossing and diversion around urban areas. In addition, the large heat consumer is likely to be a steam (rather than hot water) user, which is not uncommon for hospitals, and this adds significantly to the technical challenges of supplying heat.

For these reasons, connection to the Medway Maritime Hospital was judged to require a prohibitively costly pipe network connection, and was consequently discounted.

So in conclusion, and based on their experience of previous heat studies, they consider it is highly unlikely there will be economically viable heat loads beyond a 10 km radius from the facility.

We accept that the CBA for the Kemsley GS extension is applicable to the facility and agree with the conclusions reached.

A pre-operational condition requires the Operator to look again at opportunities for CHP in case opportunities arise between this permitting decision and the plant beginning to operate.

(vi) Choice of steam turbine

The turbine will be a non-reheat, pass out condensing design, equipped with a controlled extraction system. Under normal operating conditions the steam turbine will control the pressure within the boiler. Deviations in actual steam flow arising from changes in input waste material quality, for example, will be levelled out by the inlet pressure control of the turbine. The steam exhaust at the back end of the steam turbine is fed into the air-cooled condenser. The vacuum in the condensing section of the turbine is kept to a minimum in order to produce as much energy as possible.

(vii) Choice of cooling system

There are three main types of cooling systems:

- once through sea or river water;
- evaporative cooling tower; and
- air cooled condenser.

The Applicant has chosen the air cooled condenser for the following reasons:

- potential impacts on The Swale European site caused by abstraction and discharge of cooling waters;
- air cooled condensers do not require the use of chemical treatment or biocides;
- there is no visible plume; and
- there is no requirement for water input.

We agree with the Applicant's assessment.

(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 4 of the Permit. The following parameters are required to be reported:

- total electrical energy generated;
- electrical energy exported;
- total energy usage;

- energy exported as heat (if any); and
- total waste 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 Permit condition 4.2 and Schedule 4, including consumption of lime, activated carbon and urea (or 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 Permit condition 4.2.1. 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 and air pollution control (APC) residues.

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 3.1.5 and associated Table S3.4 specify limits for total organic carbon (TOC) of <3% 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.

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 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 have decided to include Permit condition 1.5.1, 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 PCs 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 PCs calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of PCs 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 PC 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** PC is less than **1%** of the relevant ES; and
- the **short-term** PC is less than **10%** of the relevant ES.

The **long-term** 1% PC 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% PC 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 following Application documents:

Permit Application report (JER1247, dated 31 July 2020);

Wheelabrator Kemsley (K3 Generating Station) and Wheelabrator Kemsley North (WKN) Waste to Energy Facility DCO, Chapter 5 Air Quality;

Appendix 5.3 Additional baseline assessment for other pollutants;
Habitats Regulations Assessment Report (Ref ECO00047_871 dated August 2019);

Appendix 5.4, Assessment of Ecological Impacts (JAR10341, dated March 2020);

Response to questions 1 (habitats assessment) and 2 (air quality assessment) of the duly making questions, revision 2 dated 08 October 2020;

Air Quality Assessment of Abnormal Operations, revision 1, dated 02 November 2020;

Response to Schedule 5 Notice, revision 1, dated 04 November 2020; and

Response to Schedule 5 Notice, received 17 December 2020 (impact at The Swale SPA/Ramsar/SSSI).

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.
- Dispersion modelling of the impact of additional off site road traffic arising from the operation of the incinerator.

Of these, the air quality impacts arising from additional road traffic have not been considered as these are essentially matters for the planning authority when considering the parallel Application for planning permission, and outside the scope of our determination under the Environmental Permitting Regulations.

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 of this document.

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 dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model used five years of meteorological data collected from the weather station at Gravesend between 2012 and 2016. 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 (Cd), Thallium (Tl), Mercury (Hg), Antimony (Sb), Arsenic (As), Lead (Pb), Chromium (Cr), Cobalt (Co), Copper (Cu), Manganese (Mn), Nickel (Ni) and Vanadium (V))
    - 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 and chromium (VI), which are considered in section 5.2.3 of this 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 and are considered further in section 5.2.2 of this document.

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

The Applicant has used background concentrations for NO_2 and PM_{10} within the assessment by selecting the most conservative value from a comparison of measured (local monitoring studies) and Defra mapped concentration estimates. This data is summarised in the Application and has been used by the Applicant to establish the background (or existing) air quality against which to measure the potential impact of the incinerator.

They have not stated where or how the background concentrations used to derive PECs for other pollutants were obtained. We have selected appropriate background concentrations for our check modelling and sensitivity analysis.

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.

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 predicted peak ground level exposure to pollutants in ambient air. We have conservatively assumed that the maximum concentrations occur at the location of receptors.

The Applicant's modelling predictions are summarised in the tables below. They show the **maximum predicted PC** which is compared with the relevant short and long-term ESs.

Whilst we have used the Applicant's modelling predictions in the table below, we have made our own simple verification calculation of the percentage PC and predicted environmental concentration (PEC). 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	ES		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m³		µg/m³	µg/m³	% of ES	µg/m³	% of ES
NO_2	40	1	33.10	1.41	3.53	34.51	86.28
	200	2	90.30	22.10	11.05	112.40	56.20
PM_{10}	40	1	-	0.10	0.25	-	-
	50	3	-	1.00	2.00	-	-
$PM_{2.5}$	20	1	-	0.10	0.50	-	-
SO_2	50	1	-	0.50	1.00	-	-
	266	4	64.50	36.10	13.57	100.60	37.82
	350	5	-	30.90	8.83	-	-
	125	6	24.80	16.30	13.04	41.10	32.88
HCl	750	7	-	12.40	1.65	-	-
HF	16	8	2.46	0.85	5.31	3.31	20.69
	160	7	-	0.80	0.50	-	-
CO	10000	9	-	15.90	0.16	-	-
	30000	10	-	20.71	0.07	-	-
TOC	2.25	1	0.12	0.05	2.22	0.17	7.56
PAH	0.00025	1	0.000106	0.00001	4.00	0.000116	46.4
NH_3	180	1		0.05	0.03	-	-
	2500	10	-	1.04	0.04	-	-
PCBs	0.2	1	-	0.00005	0.03	-	-
	6	10	-	0.001	0.02	-	-
Dioxins			-	1.00E-09		-	

TOC as 1,3 butadiene
PAH as benzo[a]pyrene

1 Annual Mean
2 99.79th %ile of 1-hour means
3 90.41st %ile of 24-hour means
4 99.9th ile of 15-min means
5 99.73rd %ile of 1-hour means
6 99.18th %ile of 24-hour means
7 1-hour average
8 Monthly average

9 Maximum daily running 8-hour mean

10 1-hour maximum

Pollutant	ES		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m³		µg/m³	µg/m³	% of ES	µg/m³	% of ES
Cd	0.005	1	0.00121	0.0005	10.00	0.00171	34.2
Tl [5]	30	2	-	0.01	0.03	-	-
	1	4	-	0.0005	0.05	-	-
Hg	0.25	1	-	0.0005	0.20	-	-
	7.5	2	-	0.01	0.13	-	-
Sb	5	1	-	0.005	0.10	-	-
	150	2	-	0.1	0.07	-	-
Pb	0.25	1	0.07	0.005	2.00	0.07500	30.0
Co [5]	6	2	-	0.1	1.67	-	-
	0.2	4	0.00492	0.005	2.50	0.00992	4.96
Cu	10	1	-	0.005	0.05	-	-
	200	2	-	0.1	0.05	-	-
Mn	0.15	1	0.00812	0.005	3.33	0.01312	8.75
	1500	2	-	0.1	0.01	-	-
V	5	1	-	0.005	0.10	-	-
	1	3	-	0.1	10.00	-	-
As	0.003	1	0.00563	0.005	166.67 See below	0.01063	354.33 See below
Cr (II)(III)	5	1	-	0.005	0.10	-	-
	150	2	-	0.1	0.07	-	-
Cr (VI)	0.0002	1	See below	0.005	2500.00	See below	See below
Ni	0.02	1	0.00553	0.005	25.00	0.01053	52.7

1 Annual Mean
2 1-hr Maximum
3 24-hr Maximum
4 1-hr Annual Mean
5 Applicant calculated ES

(i) Screening out emissions which are insignificant

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

- PM_{10}, $PM_{2.5}$, HCl, CO, NH_3, PCBs, Tl, Hg, Sb, Cu, 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 PEC is less than 100% (taking expected modelling uncertainties into account) of both the long and short-term ESs.

- NO_2, SO_2, HF, TOC, PAH, Cd, Pb, Co, Mn, Ni

The tables above show the results for the **maximum predicted PC**. The maximum NO_2 PC at a human health receptor is 0.83 µg/m^3 (Table 5.43, Chapter 5 Air Quality) which is 2% of the ES.

Also, the assessment of NO_2, SO_2, Cd, Pb, Co, Mn, V and Ni was carried out using the IED Chapter IV limits. Some of the daily average limits are higher than the BAT Conclusion limits. The lower limit is the starting point for setting Permit limits. This would result in a significant reduction in the impact of the order set out in the table below. On this basis, emissions of SO_2 would actually screen out as insignificant.

Limit mg/Nm^3	**NO_2**	**SO_2**	**Cd**	**Pb**	**Co**	**Mn**	**V**	**Ni**
Ch IV	200	50	0.05	0.5	0.5	0.5	0.5	0.5
BATc	120	30	0.02	0.3	0.3	0.3	0.3	0.3

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 PEC exceeds 100% of the long or short-term ES.

- As, Cr (VI)

As above, the assessment of As and Cr (VI) was carried out using the IED Chapter IV limits with daily average limits higher than the BAT Conclusion limits. The lower limit is the starting point for setting Permit limits. This would result in a significant reduction in the impact of the order set out in the table below.

Limit mg/Nm^3	**As**	**Cr (VI)**
Ch IV	0.5	0.5
BATc	0.3	0.3

Section 5.2.3 below considers these pollutants in more detail.

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 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 table above, the emission is not expected to result in the ES being exceeded.

The peak short-term PC is marginally above the level that would screen out as insignificant (>10% of the ES).

(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 ESs 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 PC 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 PC 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.

There is currently no emission limit prescribed nor any continuous emissions monitor for particulate matter specifically in the PM_{10} or $PM_{2.5}$ fraction. Whilst the Environment Agency is confident that current monitoring techniques will capture the fine particle fraction ($PM_{2.5}$) for inclusion in the measurement of total particulate matter, an improvement condition has been included that will require a full analysis of particle size distribution in the flue gas, and hence determine the ratio of fine to coarse particles. In the light of current knowledge and available data however the Environment Agency is satisfied that the health of the public would not be put at risk by such emissions, as explained in section 5.3.3 of this document.

(iii) Acid gases, SO_2, HCl and HF

From the tables above, emissions of HCl can be screened out as insignificant in that the PC is <10% of the short-term ES. There is no long-term ES for HCl.

HF has 2 assessment criteria – 1-hr and monthly ESs – the PC is >1% of the monthly ES. Whilst HF emissions cannot be screened out as insignificant, if the monthly ES is interpreted as representing a long-term ES, the Applicant's modelling shows that the Installation is unlikely to result in a breach of the ES.

There is no long-term ES 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 of this document.

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. The Applicant is required to prevent, minimise and control SO_2 emissions using BAT, this is considered further in Section 6 of this document. 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 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 and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising CO emissions 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 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 PCB emissions to be BAT for the Installation.

The above tables show that for PAH 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 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 of this document.

From the tables above ammonia emissions can be screened out as insignificant in that the PC is < 1% of the long-term ES and <10% of the short-term ES. The ammonia emission is based on a release concentration of 5 mg/m^3, which is lower than the release concentration of 10 mg/m^3 that we would usually set in the permit. We have set an ammonia limit of 5 mg/m^3 in the permit, consistent with the modelled emissions. 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 an ES.

The Applicant is required to prevent, minimise and control VOC and PAH emissions using BAT, this is considered further in Section 6 of this document. 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 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 of this document.

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:

- Tl, Hg, Sb, Cu, 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:

- Cd, Pb, Co, Mn, Ni

This left emissions of As and Cr (VI) requiring further assessment. For all other metals, the Applicant has concluded that exceedences of the ES 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 a 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 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, emissions of Cr (VI) were screened out as insignificant.

Pollutant	**ES**		**Process Contribution**	
	µg/m³		**µg/m³**	**% of EAL**
Cr (VI)	0.0002	1	2.52E-08	0.01
	0.0002	1	0.00000151	0.76

1 Annual Mean

For As, the Applicant assumed this contributed one ninth (11%) of the relevant aggregate emission limit value. The contribution from As is 0.04 to 5% in the Group 3 Metals guidance, so the Applicant's approach represents a very much worst case scenario. Whilst not screened out as insignificant, As was assessed as being unlikely to give rise to significant pollution.

Pollutant	**ES**		**Back-ground**	**Process Contribution**		**Predicted Environmental Concentration**	
	µg/m³		**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
As	0.003	1	0.00132	0.00056	18.67	0.00188	62.67

1 Annual Mean

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)

Swale Borough Council (SBC) have declared Air Quality Management Areas (AQMAs) with respect to NO_2 as follows:

Rainham AQMA
Newington AQMA
AQMA 3 - East Street, Sittingbourne
AQMA 4 - St Pauls Street, Sittingbourne
AQMA 5 – Teynham
AQMA 2/6 – Ospringe extended
Keycol Hill (proposed)

At the time of this Application, SBC was consulting Defra in relation to the St Pauls Street AQMA. It is currently designated due to high levels of NO_2 but in the future, this is likely to be designated for both NO_2 and PM_{10}.

At the time of this Application, SBC was also consulting Defra with a view to designating the area from the A249 to Rook Lane on Keycol Hill as an AQMA. Keycol Hill has therefore also been included in the assessment.

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

This table sets out the Applicant's assessment against the NO_2 annual mean (40 µg/m^3) and hourly mean (200 µg/m^3) ESs.

AQMA	**Annual mean NO_2 PC (µg/m^3)**	**PC as % of LT ES**	**Hourly mean NO_2 PC (µg/m^3)**	**PC as % of ST ES**
Rainham AQMA	0.09	0.23	1.39	0.70
Newington AQMA	0.10	0.25	2.04	1.02
AQMA 3 - East Street, Sittingbourne	0.10	0.25	2.70	1.35
AQMA 4 - St Pauls Street, Sittingbourne	0.21	0.53	3.18	1.59
AQMA 5 – Teynham	0.09	0.23	2.18	1.09
AQMA 2/6 – Ospringe extended	0.05	0.13	1.17	0.59
Keycol Hill (proposed)	0.11	0.28	2.10	1.05

This table sets out the Applicant's assessment against the PM_{10} annual mean (40 µg/m^3) and 24-hour mean (50 µg/m^3) ESs.

AQMA	**Annual mean PM_{10} PC (µg/m^3)**	**PC as % of LT ES**	**24-hour mean PM_{10} PC (µg/m^3)**	**PC as % of ST ES**
AQMA 4 - St Pauls Street, Sittingbourne	0.01	0.03	0.05	0.10

From the Applicant's model, the PC at all points within each of the AQMAs is predicted to be well below 1% of the long-term and 10% of the short-term ESs and can be considered insignificant. Therefore even though the background is already above the ES, the contribution from the Installation is negligible.

(ii) Cumulative impacts

The Applicant also considered the cumulative impacts associated with the increase in waste throughput for Kemsley GS from 550,000 tonnes/year to 657,000 tonnes/year, along with the impact associated with 27 other proposed facilities. These are facilities that aren't currently included in the ambient background concentration because at the time of the application they weren't operational. Where applicable, the maximum PC has been used to calculate the cumulative PEC and compared with the ES.

The predictions are at the point of maximum impact. In reality, the maximum impacts for each stack are unlikely to occur at the same location and therefore, the results can be considered highly conservative.

The results show that the cumulative PECs are below the ES for all pollutants and the effects are therefore not considered significant. For As (arsenic) the predictions are based on the assumption that As comprises one ninth of the group 3 metals emissions, refer to section 5.2.3 above.

(iii) Stack height determination

Stack height determination was provided in Appendix 5.2 of the Application. It considered ground level concentrations with the model run for a range of stack heights between 80 to 110 m, at 5 m increments. Results were reported for the location where the highest concentration was predicted, which is considered a conservative approach.

There were no stack heights below 110 m where the impacts could be screened out as insignificant. The Applicant concluded that the impacts would not be considered significant at 90 m or above. They concluded that this was an acceptable height with all other modelling assuming the 90 m stack height.

The results for NO_2 are tabulated below, representing the most sensitive pollutant.

Stack height (m)	PC as % of long-term ES	PC as % of short-term ES
80	5.4	8.4
85	4.2	7.0
90	3.5	5.5
95	3.0	4.4
100	2.5	3.8
105	2.1	3.3
110	1.9	3.0

Based on the throughput of the facility and the impact at sensitive receptors, we are satisfied that a 90 m stack is BAT for the facility.

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. Sections 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 still-birth and infant mortality) in relation to exposure to PM_{10} 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 June 2019, 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**
Farmer Northeast 1	0.073	0.11
Resident Kemsley 1	0.0015	0.0042
Calculated maximum daily intake of dioxins by local receptors resulting from the operation of the proposed facility (I-TEQ/ kg-BW/day)		

	Intake as % of TDI	
Receptor	**Adult**	**Child**
Farmer Northeast 1	3.65	5.50
Resident Kemsley 1	0.075	0.21

The maximum contribution of the facility to the COT TDI is for the Farmer Northeast 1 receptor. This assumes as a worst-case that these receptors produce their own home reared and home grown food at the location of maximum impact for the area and represents an extreme worst-case.

The maximum contribution is also shown for the residential receptors.

Based on a paper by the European Food Safety Authority (EFSA) the COT have recently revised their advice on dioxin/dioxin like PCBs. This has resulted in a change from a tolerable daily intake (TDI) of 2pg I-TEQ/Kg-body weight to a tolerable **weekly** intake (TWI) of 2pg I-TEQ/Kg-body weight. We have checked the Applicant's assessment taking the revised tolerable intake into account and we are satisfied that the conclusions of the assessment are not affected and that impacts will not be significant.

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 µg/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 $PM_{2.5}$ levels. The 2016 data also shows that road traffic contributed to 5.35% of PM_{10} and 4.96% of $PM_{2.5}$ and that domestic wood burning contributed 22.4% to PM_{10} and 34.3% of $PM_{2.5}$ 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 (<100 nm) 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 PC/PEC 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 PM_{10}, $PM_{2.5}$, HCl, CO, NH_3, PCBs, Tl, Hg, Sb, Cu, V and Cr (II)(III) have all indicated that the Installation emissions screen out as insignificant; where the impact of emissions of NO_2, SO_2, HF, TOC, PAH, As Cd, Cr (VI), Pb, Co, Mn, and Ni have not been screened out as insignificant, the assessment still shows that the PEC are well within the relevant ESs.

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

Our screening check calculations of dioxins, furans and dioxin-like PCB intakes, indicate that the PC is likely to be less than 10% of the COT TDI of 2 pgWHO-TEQ/kg(BW)/day, and less than 10% of the more stringent TDI of 0.29 pgWHO-TEQ/kg(BW)/day. Our checks conservatively assumed 60 hours of unabated emission at 100 times the IED ELV.

Overall, taking into account the conservative nature of the impact assessment (i.e. that it is based upon an individual exposed for a life-time 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; however they confirmed that they would not be responding. Details of the responses provided to the consultation on this Application can be found in Annex 4 of this document.

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

Habitats
The following Habitats (i.e. Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar and Marine Conservation Zones (MCZ) sites are located within 10 Km of the Installation:

The Swale Estuary MCZ;
Outer Thames Estuary SPA;
The Swale SPA / Ramsar;
Medway Estuary and Marshes SPA / Ramsar;
Thames Estuary and Marshes SPA / Ramsar; and
Queendown Warren SAC.

The Swale Estuary MCZ
The Applicant confirmed that the Swale Estuary MCZ has been excluded from the assessment as there is no requirement to assess air quality impacts at water bodies / MCZs. They confirm that the conservation objectives for the MCZ require that each protected feature is either maintained in Favourable Conservation Status (FCS) or brought into such status, if not already there. FCS means maintenance of stable structure and function of the protected features. The MCZ is an inter- and sub-tidal designated site. As such, the structure and function of the habitats is driven overwhelmingly by the marine environment as a result of being inundated by the tide twice daily. Therefore, they are not considered sensitive to changes in air quality and are excluded from the assessment.

Natural England have produced a flow chart for MCZ assessment (at link: https://designatedsites.naturalengland.org.uk/pdfs/MCZ_assessment_flowchart_March_2019.pdf) which is included in our MCZ guidance. We have followed the flow chart and conclude that the effects from the facility are ruled out from requiring a stage 1 MCZ assessment. This is because the facility is not capable of affecting (other than insignificantly) the protected features of the MCZ. We conclude that there is no significant risk of hindering the achievement of the conservation objectives of the MCZ. On this basis we have not carried out an assessment and agree with the Applicant's approach.

Queendown Warren

The Applicant confirmed that the Queendown Warren SAC is the only habitat site of those listed above that is sensitive to acid deposition. Justification was provided 05 November 2020 as follows:

The critical load function data of the interest features within the Swale shown on the Air Pollution Information System (APIS) are for the most sensitive habitats within which the species occur nationally. Such habitats do not occur within the designated sites considered in the assessment where the underlying soils are derived from fertile alluvium associated with the flood plains of The Swale, Medway and Thames. As such, these habitats are not considered sensitive to acid deposition. This position was set out in the Environmental Statement (ES) and accepted by Natural England during the examination stage in relation to the Development Consent Order Application. A copy of the ES was included as Appendix K of the Application, specifically Appendix 11.2 of the ES considers effects at designated habitat sites.

We are satisfied that this is the case.

Outer Thames Estuary SPA

The Applicant confirmed that APIS describes the habitat as inshore sublittoral sediment, which provides wintering for the red-throated diver. APIS states that this habitat is not sensitive to increases in NOx, SO_2 or NH_3 concentrations, nitrogen deposition or acid deposition. As such, this site has not been considered further in the assessment.

Justification was provided 05 November 2020 as follows:

Where it occurs within 15 km of the proposed site, the Outer Thames Estuary is almost entirely submerged (sublittoral) and, as such, not sensitive to air pollution. The two additional features not originally considered are breeding terns. The habitat supporting these interest features that is not sub-tidal is the Scroby Sands sandbar, 6km off the coast of Yarmouth, some 150 km north of the proposed site. Therefore, no effects on these interest features is predicted. This position was set out in the ES and accepted by Natural England during the examination stage in relation to the Development Consent Order Application. A copy of the ES was included as Appendix K of the Application, specifically Appendix 11.2 of the ES considers effects at designated habitat sites.

We are satisfied with this approach.

SSSI

The Swale Site of Special Scientific Interest (SSSI) is located within 2 Km of the Installation.

The Applicant confirmed that The Swale SPA covers the same geographical areas as the corresponding Ramsar and SSSI designations. The pollutant concentrations are the same at all of these sites.

We are satisfied that this is the case.

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

Elmley national nature reserve (NNR);
Milton Creek, Sittingbourne local wildlife site (LWS); and
Village Park, Iwade LWS.

5.4.2 Habitats Assessment

The Applicant's Habitats assessment 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 there would be no likely significant effect on the interest features of the protected sites with the exception of The Swale SPA / Ramsar.

Our checks indicate that maximum predictions on the grid occur within The Swale SPA / Ramsar site. Comparing our PCs to the Applicant's, their PCs are higher for the facility. We find that:

- NOx (annual and daily) and SO_2 (annual) PCs are not insignificant, but PECs do not exceed the critical levels.
- HF (daily and weekly) PCs are insignificant.
- NH_3 (annual) PCs are not insignificant. The APIS background concentration already exceeds the critical level and therefore the PEC exceeds the critical level.
- Acid deposition PCs (from NO_2, NH_3, SO_2 and HCl emissions) are not insignificant, but the critical load function is not predicted to be exceeded when background deposition rates are considered.
- Nutrient nitrogen deposition PCs (from NO_2 and NH_3 emissions) are not insignificant and the background deposition already exceeds the critical loads. The PEC therefore exceeds the critical load.

Our checks indicate that PCs at other European designated conservation sites (Medway Estuary and Marshes SPA / Ramsar; Thames Estuary and Marshes SPA / Ramsar; Queendown Warren SAC; and Outer Thames Estuary SPA) are insignificant (less than 1%) for critical level and critical load assessment.

Where the PC does not exceed 1% of the critical level or load (long-term), PC does not exceed 10% of the critical level (short-term) and the PEC does not exceed 70% of the critical level or load we concluded no likely significant effect.

The Swale SPA / Ramsar

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	PC (µg/m³)	PC as % of ES	PEC (µg/m³)	PEC as % ES
Direct Impacts (2)						
NO_x Annual	30	21.4	1.2	4	22.6	75.33
NO_x Daily Mean	75	42.8	12.9	17.2	55.7	74.27
SO_2	20 (1)	3.73	0.5	2.5	4.23	21.15
Ammonia	3 (1)	3.6	0.05	1.66	3.65	121.67
HF Weekly Mean	0.5	-	0.051	10.2	-	-
HF Daily Mean	5	-	0.11	2.2	-	-
Deposition Impacts (2)						
N Deposition (kg N/ha/yr) (4)	10	26.6	0.43	4.3	27.03	270
	20			2.15		135
	30			1.43		90
Acidification (Keq/ha/yr)	(3)	-	-	-	-	-

(1) The lower lichen and bryophyte sensitivity standards for ammonia and sulphur dioxide have not been assigned for this assessment as the presence of these features has not been recorded in the site Management Plan.
(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.
(3) Habitat not sensitive to acid deposition.
(4) Assessments based on the range of critical loads, see below.

Annual mean NOx,
The maximum annual-mean PC exceeds 1% of the critical level; and the PEC is above 70% of the critical level.

On that basis, we cannot state that the impacts from the facility are not likely to have a significant effect on the qualifying features of the SPA/Ramsar.

We considered these impacts further, see below.

Daily mean NOx
The maximum daily mean PC exceeds 10% of the critical level; and the PEC is above 70% of the critical level.

On that basis, we cannot state that the impacts from the facility are not likely to have a significant effect on the qualifying features of the SPA/Ramsar.

We considered these impacts further, see below.

Annual mean SO_2
The maximum annual-mean PC exceeds 1% of the critical level; however the PEC is <70% of the critical level.

On that basis the impacts from the facility are not likely to have a significant effect on the qualifying features of the SPA/Ramsar and therefore require no further consideration.

Annual mean NH_3
The maximum annual-mean PC exceeds 1% of the critical level and the PEC is greater than the critical level.

On that basis, there is potential for the facility to have a significant effect on the qualifying features of the SPA/Ramsar.

We considered these impacts further, see below.

Daily and weekly mean HF
The HF daily mean PC is screened out as insignificant at <10% of the short-term critical level, with the weekly mean only marginally above the 10% insignificance threshold at 10.2%.

The daily and weekly assessment criteria are interpreted as representing short-term impacts.

The PC at 10.2% of the weekly mean critical level is based on 100% operation as well as a number of other conservative assumptions set out in section 5.2 above. Based on actual operation, 94% of the year, the PC would actually be 9.6% of the critical level and subsequently screened out as insignificant.

On that basis, the impacts from HF are not likely to have a significant effect on the qualifying features of the SPA/Ramsar and therefore require no further consideration.

Nutrient N deposition

When considering critical loads of 10 or 20 kgN/ha/yr, the PC exceeds 1% and the PEC is greater than the critical load.

On that basis, there is potential for the facility to have a significant effect on the qualifying features of the SPA/Ramsar.

We considered these impacts further, see below.

For a critical load of 30 kgN/ha/yr the PC is 1.43% and the PEC is above 70% of the critical load (Natural England agree with the applicability of the higher critical load).

On that basis, there is potential for the facility to have a significant effect on the qualifying features of the SPA/Ramsar.

We considered these impacts further, see below.

Swale SPA / Ramsar Cumulative impacts

The Applicant's air quality assessment considers the PEC where the PCs are not insignificant. Our Habitats guidance uses a PEC of greater than 70% as a trigger for consideration under an appropriate assessment. In this case long and short-term NOx, NH_3 and N deposition are above this threshold. Further consideration of the in-combination effects are assessed further.

The PEC comprise emissions from the facility, as well as background pollution levels. In-combination impacts are therefore accounted for by the assessment of PEC (background levels will include emissions from various pollution sources, such as other industry and traffic).

The Applicant also considered the cumulative impacts from facilities that aren't currently included in the ambient background concentration. This included the impacts associated with the increase in waste throughput for the neighbouring Kemsley GS facility from 550,000 tonnes/year to 657,000 tonnes/year, along with the impact associated with other proposed facilities. The developments are Kemsley GS (EN010090 (18/50 1923/ADJ), Kemsley AD (SW/11/1291), Reserve Power Plant PC (18/500393/FULL) & Garden of England Energy Facility. These are developments where there was sufficient detail from planning applications to allow a PC to be added to give a cumulative PEC for ecological receptors.

The maximum cumulative PECs are tabulated below.

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	Cumul. PC (µg/m³)	Cumul. PC as % of ES	Cumul. PEC (µg/m³)	Cumul. PEC as % ES
Direct Impacts (2)						
NO_x (Annual)	30	21.4	2.7	9	24.1	80.33
NOx (Daily mean)	75	42.8	40.8	54.4	83.6	111
Ammonia (Annual)	3 (1)	3.6	0.17	5.67	3.77	126
Deposition Impacts (2)						
N Deposition (kg N/ha/yr) (3)	10	26.6	2.97	29.7	29.57	296
	20			14.85		148
	30			9.9		98.57

(1) The lower lichen and bryophyte sensitivity standards for ammonia and sulphur dioxide have not been assigned for this assessment as the presence of these features has not been recorded in the site Management Plan.
(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.
(3) Assessments based on the range of critical loads, see below.

Annual mean NOx

The maximum annual mean cumulative PC exceeds 1% of the critical level. However the cumulative PEC is less than 100% of the critical level (80.33%).

This assessment is highly conservative. Following our guidance, if the PEC is less than 100% of the critical level, we can conclude no adverse effect to the integrity of The Swale SPA/Ramsar.

Daily mean NOx

The maximum daily mean cumulative PC exceeds 10% of the critical level and the cumulative PEC is greater than 100% of the critical level.

However, the applicant has doubled the annual mean background for a 24 hour average and assumed the maximum daily NOx PC from the other sites will coincide with the maximum daily NOx from the facility and Kemsley GS.

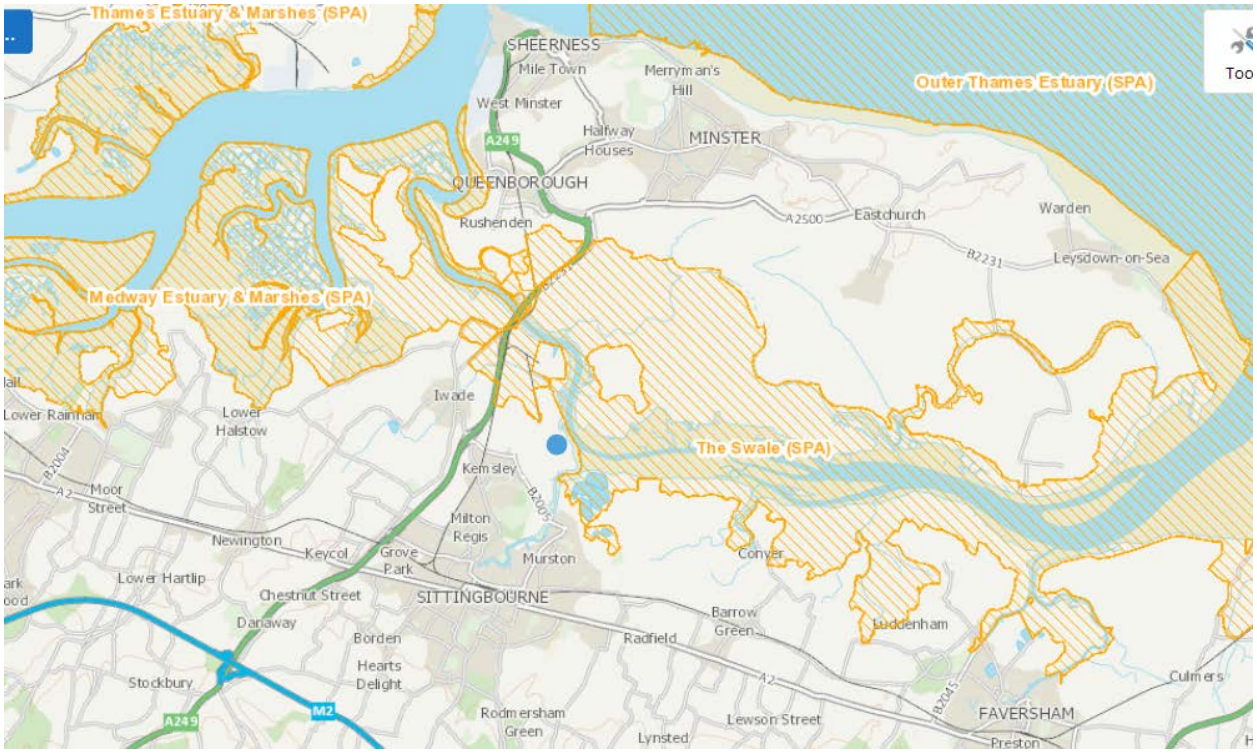
This is highly conservative. Our checks indicate that it is unlikely that the cumulative PEC will exceed a daily NOx critical level of 75 µg/m^3.

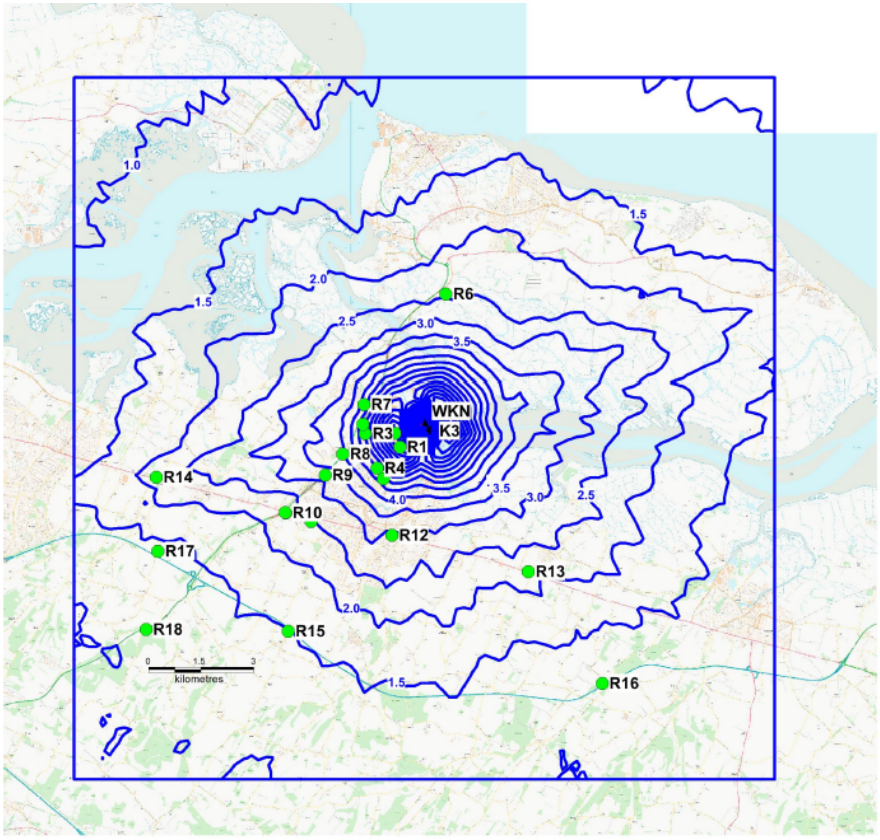
The way in which the Applicant used the dispersion model, its selection of input data, use of background data and the assumptions it made were reviewed by the Environment Agency's modelling specialists to establish the robustness of the Applicant's air impact assessment. The output from the model has then been used to inform further assessment of the impact on the habitats sites. The modelling is based on a number of highly conservative assumptions set out in section 5.2 of this document, which will over-estimate any impact.

Our review of the Applicant's assessment leads us to agree with the Applicant's conclusions.

Notwithstanding the above, the main risk of NOx to the environment would be likely to be through its contribution to total nitrogen deposition (nutrient enrichment) (see below) to the habitats and vegetation rather than from aerial concentrations directly. Any impacts on the designated birds will be indirect through influences on plant and animal food sources, vegetation composition and cover, associated mainly with nutrient enrichment.

The map and isopleths below show the hourly mean NO_2 PCs from the proposed facility and the adjacent Kemsley GS (K3) facility. PCs < 7.5 µg/m^3 would screen out as insignificant i.e. < 10% of the short-term standard of 75 µg/m^3. The figures demonstrate that impacts only exceed the 10% insignificance criteria for a very small area of the SPA close to the facility.





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Client: Wheelabrator Technologies Inc

Project: K3 and WKN DCO

Title: Contour of 99.79th Percentile Hourly-mean NO2 PCs (Increase in K3 and WKN)

Status	Drawn By:	PIM/Checked By:
Final	FP/CR	KB
Job Ref	Scale @ A3	Date Created
OXF9812	NTS	NOV 2018

Figure Number: 5.4

On the basis of the above, the impacts from short-term NOx from the proposed site on ecological receptors in The Swale SPA/Ramsar, we conclude that operation of the facility would not result in adverse effects on the integrity of the habitats and species present.

Annual mean NH_3

The maximum annual-mean cumulative PC exceeds 1% of the critical level and the cumulative PEC is greater than the critical level.

The Applicant has used the maximum ambient concentration of NH_3 (3.6 $\mu g/m^3$) within The Swale which already exceeds the critical level of 3 $\mu g/m^3$ with or without the facility and the other cumulative developments. NH_3 is dominated by the existing background levels, with the PC from the facility being <1.4% of the existing background levels.

Any further small increase in background levels from other developments will not affect the overall conclusion that the contribution from the proposed facility is small and so in-combination effects will not cause an adverse effect.

The impact assessments and dispersion modelling are based on a number of highly conservative assumptions set out in section 5.2 of this document, which over-estimates any impact.

From APIS's source attribution tool, the majority of this exceedance is driven by agricultural activity, in particular livestock farming, which form an inherent component of the grazing marsh within The Swale designated sites. Ammonia emissions from both cattle themselves and the fertiliser applied to grazed fields are considerable, as reflected in their dominance of the source attribution data.

Notwithstanding the above, impact from NH_3 is considered to be of low importance as the intertidal habitats within The Swale designated sites are typically subject to being submerged by the tide twice daily, which significantly reduces any impacts.

Given the prevalence of cattle grazing across the designated site dominating the existing ammonia concentration, the small additional increase as a result of the cumulative developments is highly unlikely to be significant in ecological terms.

Further, the method for calculating the cumulative increase is highly conservative, using the maximum predicted PC within The Swale designated sites from each of the developments for which data are available and summing them with the maximum PC from the facility (i.e. assuming all occur in the same location as that of the facility). In reality, given the size of The Swale the various maxima PC will be located at some distance meaning any effect will be of smaller magnitude than the predictions tabulated.

On that basis, we can conclude the impacts from the facility are not likely to have an adverse effect on the integrity of the SPA/Ramsar.

Nutrient N deposition

When considering critical loads of 10 or 20 kgN/ha/yr, the cumulative PC exceeds 1% and the cumulative PEC is greater than the critical load.

For a critical load of 30 kgN/ha/yr the cumulative PC exceeds 1%; however the cumulative PEC is below 100% of the critical load (98.5%).

The majority of the habitats present within The Swale designated sites in the location around the proposed development are either intertidal mudflats or cattle-grazed, grazing marsh. N deposition is considered to be of low importance for these habitats which are typically subject to being submerged by the tide twice daily and because of the high-nutrient status systems, especially when grazed. As such, these habitats are not expected to be significantly affected by N deposition compared to other sources.

The Applicant confirmed that this was specifically agreed with Natural England in the Statement of Common Ground in relation to these habitats when present adjacent to the A249 (paragraph 2.3.6) but is also relevant here as the habitats are the same.

There are areas of salt marsh present away from the peak deposition location. However, the majority of these are early pioneer for which a critical load of 30 kgN/ha/yr is appropriate. As such, the cumulative PEC is below 100% the critical load.

Natural England agree with the applicability of the higher critical load.

On that basis, the impacts from the facility are not likely to have an adverse effect on the integrity of the SPA/Ramsar.

Medway Estuary and Marshes SPA / Ramsar

Pollutant	ES ($\mu g/m^3$)	PC ($\mu g/m^3$)	PC as % of ES
Direct Impacts (2)			
NO_x Annual	30	0.2	0.67
NO_x Daily Mean	75	3.8	5.06
SO_2	20 (1)	0.05	0.25
Ammonia	3 (1)	0.005	0.17
HF Weekly Mean	0.5	0.005	1
HF Daily Mean	5	0.02	0.4
Deposition Impacts (2)			
N Deposition (kg N/ha/yr)	10-30	0.06	0.6
Acidification (Keq/ha/yr)	(3)	-	-

(1) The lower lichen and bryophyte sensitivity standards for ammonia and sulphur dioxide have not been assigned for this assessment as the presence of these features has not been recorded in the site Management Plan.
(2) Direct impact units are $\mu g/m^3$ and deposition impact units are kg N/ha/yr or Keq/ha/yr.
(3) Habitat not sensitive to acid deposition.

PCs are screened out as insignificant at <1% of the long-term and <10% of the short-term critical levels and critical loads.

We conclude that the facility is not likely to have a significant effect on the qualifying features of the SPA / Ramsar.

Thames Estuary and Marshes SPA / Ramsar

Pollutant	ES (µg/m³)	PC (µg/m³)	PC as % of ES
Direct Impacts (2)			
NO_x Annual	30	0.1	0.33
NO_x Daily Mean	75	0.9	1.2
SO_2	20 (1)	0.02	0.1
Ammonia	3 (1)	0.002	0.07
HF Weekly Mean	0.5	0.002	0.4
HF Daily Mean	5	0.00	0.00
Deposition Impacts (2)			
N Deposition (kg N/ha/yr)	8-30	0.02	0.25
Acidification (Keq/ha/yr)	(3)	-	-

(1) The lower lichen and bryophyte sensitivity standards for ammonia and sulphur dioxide have not been assigned for this assessment as the presence of these features has not been recorded in the site Management Plan.
(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.
(3) Habitat not sensitive to acid deposition.

PCs are screened out as insignificant at <1% of the long-term and <10% of the short-term critical levels and critical loads.

We conclude that the facility is not likely to have a significant effect on the qualifying features of the SPA / Ramsar.

Queendown Warren SAC

Pollutant	ES ($\mu g/m^3$)	PC ($\mu g/m^3$)	PC as % of ES
Direct Impacts (2)			
NO_x Annual	30	0.1	0.33
NO_x Daily Mean	75	1	1.33
SO_2	10 (1)	0.02	0.2
Ammonia	1 (1)	0.002	0.2
HF Weekly Mean	0.5	0.003	0.6
HF Daily Mean	5	0.01	0.2
Deposition Impacts (2)			
N Deposition (kg N/ha/yr)	15	0.02	0.13
Acidification (Keq/ha/yr)	0.856	0.004	0.47

(1) The lichen and bryophyte sensitivity standards for ammonia and sulphur dioxide have been assigned for this assessment as the 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 $\mu g/m^3$ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

PCs are screened out as insignificant at <1% of the long-term and <10% of the short-term critical levels and critical loads.

We conclude that the facility is not likely to have a significant effect on the qualifying features of the SAC.

5.4.3 SSSI Assessment

The Applicant's Habitats assessment was reviewed by the Environment Agency's technical specialists for modelling, air quality, conservation and ecology technical services. Our checks are the same as those detailed above for The Swale SPA / Ramsar.

The impacts and conclusions drawn are the same as those tabulated above for The Swale SPA / Ramsar.

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.

The Applicant's assessment 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 i.e. that at non-statutory sites PCs are well below the 100% no significant pollution criteria.

Elmley NNR

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	PC (µg/m³)	PC as % of ES	PEC (µg/m³)	PEC as % ES
Direct Impacts (2)						
NO_x Annual	30	12.3	2	6.67	14.3	47.67
NO_x Daily Mean	75	24.6	21.4	28.53	46	61.33
SO_2	20 (1)	0.29	0.5	2.5	0.79	3.95
Ammonia	3 (1)	0.88	0.05	1.67	0.93	31
HF Weekly Mean	0.5	-	0.051	10.2	-	-
HF Daily Mean	5	-	0.11	2.2	-	-
Deposition Impacts (2)						
N Deposition (kg N/ha/yr)	20-30	14.2	0.55	2.75	14.75	73.75
Acidification (Keq/ha/yr)	(3)	-	-	-	-	-

(1) The lower lichen and bryophyte sensitivity standards for ammonia and sulphur dioxide have not been assigned for this assessment as the presence of these features has not been recorded in the site Management Plan.

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

(3) Habitat not sensitive to acid deposition.

For the Elmley NNR the PCs are below the critical levels and loads. We are satisfied that the facility 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 of this document.

Milton Creek, Sittingbourne LWS

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	PC (µg/m³)	PC as % of ES	PEC (µg/m³)	PEC as % ES
Direct Impacts (2)						
NO_x Annual	30	12.3	0.7	2.33	13	43.33
NO_x Daily Mean	75	24.6	17.7	23.6	42.3	56.4
SO_2	20 (1)	-	0.17	0.85	-	-
Ammonia	3 (1)	-	0.017	0.57	-	-
HF Weekly Mean	0.5	-	0.024	4.8	-	-
HF Daily Mean	5	-	0.09	1.8	-	-
Deposition Impacts (2)						
N Deposition (kg N/ha/yr)	20-30	-	0.19	0.95	-	-
Acidification (Keq/ha/yr)	(3)	-	-	-	-	-

(1) The lower lichen and bryophyte sensitivity standards for ammonia and sulphur dioxide have not been assigned for this assessment as the presence of these features has not been recorded in the site Management Plan.

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

(3) Habitat not sensitive to acid deposition.

For the Milton Creek, Sittingbourne LWS the PCs are below the critical levels and loads. We are satisfied that the facility 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 of this document.

Village Park, Iwade LWS

Pollutant	ES ($\mu g/m^3$)	PC ($\mu g/m^3$)	PC as % of ES
Direct Impacts (2)			
NO_x Annual	30	0.2	0.67
NO_x Daily Mean	75	5.33	7.11
SO_2	20 (1)	0.05	0.25
Ammonia	3 (1)	0.005	0.17
HF Weekly Mean	0.5	0.01	2
HF Daily Mean	5	0.03	0.6
Deposition Impacts (2)			
N Deposition (kg N/ha/yr)	10	0.05	0.5
Acidification (Keq/ha/yr)	Min N 0.357 Max S 1.87	N-0.004 S-0.006	1.12 0.32

(1) The lower lichen and bryophyte sensitivity standards for ammonia and sulphur dioxide have not been assigned for this assessment as the presence of these features has not been recorded in the site Management Plan.

(2) Direct impact units are $\mu g/m^3$ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

For the Village Park, Iwade LWS we conclude that the impacts are screened out as insignificant.

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 four 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 four 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 four 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 therefore consideration of abnormal operations is limited to consideration of its impact on short-term ESs.

In their assessment the Applicant used the PCs from table 5.39 of the air quality assessment which are the predicted maximum PCs at long-term ELVs.

Table 5.38 of this report provides the predicted maximum PCs at the short-term ELVs. For the parameters in this table we have used the higher worst case PC. The impacts are presented in the table below.

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

- Dioxin emissions of 10 ng/m^3 (100 x normal) *
- Mercury emissions are 100 times those of normal operation
- NO_x emissions of 600 mg/m^3 (3 x normal ELV of 200 mg/m^3)
- Particulate emissions of 150 mg/m^3 (5 x normal) **
- Metal emissions other than mercury are 5 times those of normal operation ***
- SO_2 emissions of 850 mg/m^3 (4.25 x normal)
- HCl emissions of 1,820 mg/m^3 (30.33 x normal)
- HF emissions of 10 mg/m^3 (2.5 x normal)
- PCBs (100 x normal)

*The effect of elevated short-term emissions of dioxins and furans is not considered likely to be significant as they accumulate slowly in the body over time due to inhalation and ingestion (a time period of 70 years is assumed for life-time exposure to dioxins and furans). Accordingly, a short-term emission of 100 times the benchmark value for four hours will have no acute effect by inhalation on human health.

** The Applicant has accounted for the ES for PM_{10} being based on a daily-average. They have calculated emissions during the abnormal operation assuming that the plant operates abnormally for four hours during any 24 hour period. The IED specifies a maximum emission concentration during abnormal operations of 150 mg/Nm^3 for total dust, which is five times greater than the maximum emission concentration of 30 mg/Nm^3 specified in the IED during normal operations. The 24-hour average PC for PM_{10} under abnormal operations has been calculated using the following formula: PC (normal) x [(5 x 4/24) + (20/24)]

*** The Applicant's assessment was based on 100 x normal, which significantly over estimates the impacts. We have assessed based on 5 times normal as presented in the table below.

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 of the short-term environmental impact is summarised in the table below.

Pollutant	**ES**		**Back-ground**	**Process Contribution (PC)**		**Predicted Environmental Concentration (PEC)**	
	µg/m^3		**µg/m^3**	**µg/m^3**	**% of EAL**	**µg/m^3**	**% of EAL**
NO_2	200	2	90.3	33.18	16.6	123.48	61.7
PM_{10}	50	3	-	1.66	3.32	-	-
SO_2	266	4	64.5	153.43	57.7	217.93	81.9
	350	5	64.5	131.33	37.52	195.83	56.0
HCl	750	6	[7]	376.1	50.15	[7]	[7]
HF	160	6	-	2	1.25	-	-
Hg	7.5	1	0.01	1.04	13.87	1.05	14.0
Sb	150	1	-	0.52	0.35	-	-
Cu	200	1	-	0.52	0.26	-	-
Mn	1500	1	-	0.52	0.03	-	-
PCBs	6	1	-	0.104	1.73	-	-
Cr (II)(III)	150	1	-	0.52	0.35	-	-
Dioxins				1.00E-07		1.00E-07	

1 1-hr Maximum
2 99.79th %ile of 1-hour means
3 90.41st %ile of 24-hour means
4 99.9th ile of 15-min means
5 99.73rd %ile of 1-hour means
6 1-hour average
7 not provided *

* Assessed by the Environment Agency's technical specialists for modelling, air quality, conservation and ecology technical services, see below.

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

PM_{10}, HF, Sb, Cu, Mn, PCBs and 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 PEC is less than 100% of short-term ES.

NO_2, SO_2, and Hg.

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 5.3.3 of this document. In these circumstances the TDI would be 0.184 pg(I-TEQ/ kg-BW/day), which is 9.19 % of the COT TDI. The Applicant used the following approach to assess the impact: an increase of 100 times for 60 hours per year will increase the amount deposited over a year by a factor of:
[(100 x 60/8760) + (8700/8760)] = 1.67
(1.67 x 0.11 = 0.184).

At this level, emissions of dioxins will still not pose a risk to human health.

The Applicant's assessment of abnormal operation 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.

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 (BAT) as laid down in the decisions on BAT conclusions. These limits are set in Table S3.1 of the Permit. 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 Table S3.1(b) of the Permit and are normally higher than 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.

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 (BAT) 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 they have 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, HF,TOC, PAH, Cd, As, Cr (VI), Pb, Co, Mn, As, Cr (VI), Ni

- 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 December 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 processes 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 hazardous wastes	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 to 70 t/h	• Good mixing • High steam parameters up to 500^{o}C • 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
- Fluidised bed furnace
- Gasification
- Pyrolysis
- Plasma arc gasification

The Applicant has assessed each option as follows:

Moving grate furnace
Most widely used system for MSW and MSW-derived fuel applications and as such are well proven and reliable. The moving grate system is capable of burning MSW fuel as received as well as processed fuels such as RDF or SRF.

Fluidised bed furnace
Requires a homogenous feedstock. This technology would not be suited to the type of residual MSW material proposed for the facility, although it would be suited to the SRF portion of the incoming waste.

Gasification
Operationally, a homogeneous incoming waste stream with a high organic content is required to obtain consistent gas quality. Therefore, this technology is better suited to applications where the incoming waste material has been pre-treated, which is not applicable to this facility.

Pyrolysis
There is limited experience of the application of pyrolysis technology for the treatment of MSW or RDF, its presence in the market is not well established and its commercial application is limited. This technology is not considered proven or viable for the scale and nature of this waste facility.

Plasma arc gasification
To date the process has been used mainly to treat hazardous wastes including organics, metals, polychlorinated biphenyls (PCBs) (including small-scale equipment) and hexachlorobenzene (HCB). This technology is not considered proven or viable for the scale and nature of this waste facility.

Moving grate and fluidised bed are most suited to the amount and types of waste to be processed at the facility.

- Moving grate can cope with unprocessed fuels and variable waste compositions.
- Primary NOx emissions are slightly lower with fluidised bed, which means that less ammonia would be required to meet emission limits.
- Raw material usage is lower for the moving grate as sand is required to create the fluidised bed.

The Applicant has proposed to use a furnace technology comprising of a moving grate 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 fuel-oil as support fuel for start-up, shut-down and for the auxiliary burners. The choice of support fuel provides guaranteed availability.

Boiler Design

In accordance with BAT 30 of the BAT conclusions 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 in 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 (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 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	Relies on an optimum temperature around 900 °C, and sufficient retention time for reduction	Port injection locations	All plant unless lower NOx release required for local environmental protection

	Lower costs than SCR	May lead to Ammonia slip		
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.

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 – The Applicant confirmed that this will not be implemented and justified this as follows: Given that the design minimises NOx levels and any energy efficiency benefits reported using FGR are not borne out in practice, the resulting impact on the overall reliability of the facility from FGR is not considered justified and the proposed combination of measures is considered to represent BAT.

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 or urea as the reagent, see below.

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	£606.70	2.99	36.1
SNCR	£121.69	7.16	40.3

Note that the PC and PEC are taken from the Applicant's H1 assessment to enable a comparison on an equal basis. It should be noted that modelled values are lower, for example the maximum long-term PC across the grid from the facility assuming NOx at IED limits (200mg/Nm^3) is 1.41 µg/Nm^3 and associated PEC is 34.51 µg/Nm^3.

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 not made a final decision on the use of urea or ammonia. For the basis of this Application (other than the site condition and baseline report) quantified data has been based on urea. Should ammonium hydroxide be used confirmation of usage etc. will be confirmed.

They have compared the use of urea / ammonia as follows:

Whilst the reduction reaction of urea gives rise to higher releases of nitrous oxides (N_2O) with corresponding global warming potential (GWP) impacts, urea presents lower handling and storage hazards compared to ammonium hydroxide. Nitrous oxide has a GWP of 310, compared to carbon dioxide with a GWP of 1. Consequently the decision is a balance between the increased hazard risks and reagent consumption associated with ammonium hydroxide versus the increased GWP impacts associated with urea.

The Environment Agency agrees with this assessment and have set a pre-operational condition requiring information on the choice of urea or ammonia.

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. An improvement condition requires the Operator to report to the Environment Agency on optimising the performance of the NO_x abatement system. The NH_3 limit has been set at 5 mg/m^3 based on modelled emissions, which is lower than the BAT AEL of 10 mg/m^3. The Operator is also required to monitor and report on N_2O emissions annually.

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 gas-oil 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 concentratio	Large effluent disposal and water consumption if not fully treated for re-cycle Effluent treatment plant required May result in		Used for wide range of waste types Can be used as polishing step after other techniques where

	n and flow rate	wet plume Energy required for effluent treatment and plume reheat		emissions are high or variable
Dry	Low water use Higher reagent consumption to achieve emissions of other FGC techniques but may be reduced by recycling in plant Lower energy use Higher reliability Lowest visible plume potential	Higher solid residue production Reagent consumption controlled only by input rate		All plant
Semi-dry (also described as semi-wet in the Bref)	Medium reaction rates Reagent delivery may be varied by concentratio n 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			Generally applicable to grate and rotary kiln plants.

	emissions and reduced reagent usage			
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 fuel-oil as the support fuel on the basis of guaranteed availability and we agree with that assessment.
- 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, semi-dry and wet methods as 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 has been proposed by the Applicant.

In this case, the Applicant proposes to use the dry acid gas abatement system with dry hydrated lime. The Environment Agency is satisfied that this is BAT.

Dosage rates of hydrated lime will be controlled and monitored to ensure usage is optimised and to avoid over dosing resulting in increased quantities of unreacted material within the APC residues. Dosage will be controlled against raw gas concentrations of SO_2 and HCl.

6.2.4 Carbon monoxide and volatile organic compounds (VOCs)

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

Carbon monoxide and 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.

In this case the Applicant proposes injection of activated carbon using a 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 during	Consumption of aqueous		Not suitable for pyrolysis

injection	mercury peaks. Oxidation of mercury leading to improved removal in downstream removal method.	bromine. Can lead to formation of polybrominated dioxins. Can damage bag filter. Effects can be limited use is restricted to dealing with peak emissions		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.

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 (GWP) 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 CO_2 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 similar or improved to the other options 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 the 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 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 850ºC 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 250-450ºC
- 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

Under normal operation there will be no process discharges to surface water or sewer. In the event of a full boiler maintenance the boilers will need to be emptied. This water will be collected in the boiler pit and will be used within the bottom ash quench system.

During heavy rain fall, rainwater may overflow from the rain water storage tank and surface water lagoon to a discharge point into The Swale. This water has already passed through an oil interceptor and will be uncontaminated.

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

Discharges to sewer will be limited to domestic effluents from the on-site amenities, which are outside of this Permit remit. There will be no process discharges to sewer.

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.

Good housekeeping practices will be in operation to ensure that any spillages of potentially dusty materials are cleared up at the earliest opportunity. Spill kits will be available for clean-up of all chemicals (i.e. boiler water treatment chemicals) and oils (i.e. fuel oil and maintenance oils) stored and used within the facility and will be located in proximity to the relevant storage area(s) and/or delivery points. Site procedures will detail those actions which should be followed in the event of a spillage.

The incoming waste material storage bunkers will be constructed of concrete and will be impervious.

The IBA discharges from the grate to the ash quench bath. From here the quenched IBA is transported to an off-site IBA processing facility if re-use routes aren’t available.

All process areas will be located on hard standing.

All bunds provided for chemical and oil storage tanks will be manually inspected to ensure they remain empty.

Bunds will all be designed to contain at least 110% of the contents of the largest storage tank or 25% of the total tankage, whichever is the greater and will be resistant to the material which they are designed to contain.

Underground structures will be limited to the lower parts of the bunker, site drains, drainage sumps, rainwater tank, fire-water/temporary rain-water tank and incoming clean water systems.

At the time of the Application the final detail of the precise routing for underground drains had not been established The Applicant confirmed that this will form part of the detailed design stage. We have set a pre-operational condition requiring the submission of the drainage plans for approval.

During commissioning the underground surface drains and foul drains will be subject to integrity testing and will be certified as sound prior to the facility operations commencing. These drains will subsequently be tested after six years of operation. The condition at that time will be confirmed by CCTV inspections and will subsequently determine the inspection frequency for further inspections.

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

The Applicant confirmed that the primary source of odour from the proposed facility will be from the incoming treated waste materials. Waste accepted at the Installation will be delivered in covered vehicles. The fuel bunker will be ventilated under negative pressure.

Under normal operation effective odour control will be achieved through the extraction of air from above the waste bunker and the use of this air as combustion air within the furnace, thereby reducing odours.

In the event of a full plant shut-down, waste volumes will be run down prior to the shut-down to minimise the amounts of material remaining in the bunker. Where possible, the shut-down will be timed to coincide with periods where the facility waste deliveries can be minimised.

Doors to the waste reception hall will remain closed at all times other than for access, which will be made via fast acting roller shutters.

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.

6.5.5 Noise and vibration

A noise impact assessment was provided in Appendix D of the Application identifying 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 results of the assessment indicate that significant adverse noise or vibration effects would not be expected as a result of operating the facility and we agree with this assessment.

We recommend the inclusion of a number of specific control measures to be included in the noise management plan. This shall be addressed by a pre-operational condition requiring the submission of a noise management plan which includes the following:

- mitigation of beat frequencies between the air-cooled condensers by employing controllable frequency fan motors
- acoustically attenuated louvres
- operation of the roller shutter doors

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.

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 (BAT) as laid down in the decisions on BAT conclusions.

BAT conclusions for waste incineration or co-incineration were published December 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 as set out in the sections above:

- the location of human receptors
- the location of ecological receptors and wildlife

Permit conditions will ensure that the Installation is unlikely to have a significant effect on any local receptor.

No specific additional conditions are required.

(ii) National and European ESs

Emission limits have been set that will ensure the Installation is unlikely to contribute to an exceedance of these standards.

No specific additional conditions are 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

A pre-operational condition has been set that requires a commissioning plan to be submitted to us. The plan will include measures to ensure environmental protection during commissioning.

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 of the Permit 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;
- enable correction of measured concentration of substances to the appropriate reference conditions;
- gather information about the performance of the SNCR system;
- establish data on the release of dioxin-like PCBs and PAHs from the incineration process; and
- 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 on 'Monitoring stack emissions' (formerly M2).

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 2.3.10 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.

Mercury

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 the mercury content of the waste will be low and stable.

The Applicant originally proposed to undertake continuous monitoring for mercury; however in their email received 13 January 2021 they confirmed that this would be periodic.

We have therefore set manual extractive monitoring in the Permit. However the Permit requires the stable and low criteria to be demonstrated through improvement condition IC10 and we can require continuous monitoring for mercury if required.

Dioxins

For dioxins long-term monitoring does not apply if emissions are stable.

Based on the waste types and control measures proposed in the Application we expect that emissions of dioxins will be 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 condition IC9 so we can require long-term monitoring for dioxins if required.

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

BAT AELs (daily averages) do not apply during periods 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. A pre-operational condition ensures OTNOC scenarios are defined.

6.7.5 Monitoring for Medium Plant Combustion Directive (MPCD)

We have set CO monitoring for the back-up fuel-oil fired electrical generator in accordance with the MPCD where measurement of CO is required for all plant. Compliance with the emission limit values set out in Part 2 of Annex II of the Directive are not required as the plant will operate for less than 500 hours/year.

6.8 Reporting

We have specified the reporting requirements in Schedule 4 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 decision of the Secretary of State to refuse planning permission on 19 February 2021.
- The report and decision notice of National Infrastructure Planning accompanying the refusal of planning permission.
- The response of the Environment Agency to the local planning authority in its role as consultee to the planning process.

We have reviewed the reasons given for the refusal of planning permission and specifically whether this conclusion is based on information given in the Environmental Statement. We are satisfied that these matters are entirely matters of planning policy and not relevant to our determination. The pollution control and planning regimes are intended to be complementary and should avoid duplication.

From our consideration of all the documents above, the Environment Agency considers that no additional or different 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 and National Infrastructure Planning. 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 of this document).

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.

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 takes 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 on the original application. The way in which this has been done is set out in section 2.2 of this document. A summary of the responses received to our consultations and our consideration of them is set out in Annex 4 of this document.

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.

(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 of this document, 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 which we sent to Natural England for consultation 24 December 2020.

The CROW assessment is summarised in greater detail in section 5.4.3 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 **Marine and Coastal Access Act 2009**

Section 58 of this Act requires us to act in accordance with appropriate marine policy documents, unless relevant considerations indicate otherwise.

Section 125 of this Act requires that, so far as is consistent with their proper exercise, we exercise our functions in a manner that we consider best furthers the conservation objectives stated for Marine Conservation Zone(s) (MCZs) certain features of which are capable of being affected by our determination (to more than an insignificant degree) or else, where this is not possible, which least hinders the achievement of those objectives.

Section 126 of this Act requires that, before granting a Permit for an Installation capable of affecting certain features of a MCZ(s) (to more than an insignificant degree), we consult with Natural England and that we are satisfied that there is no significant risk of the operation of the Installation hindering the achievement of the conservation objectives stated for any relevant MCZ(s).

We have considered the Application and are satisfied that it would not affect, to more than an insignificant degree, the protected features of MCZs or the ecological or geomorphological process on which the conservation of such features are dependent.

7.2.8 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.

7.2.9 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.

We consulted Natural England by means of an Appendix 11 assessment, and they agreed with our conclusion, that the operation of the Installation would not have a likely significant effect on the interest features of protected sites.

The habitat assessment is summarised in greater detail in section 5.4.2 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.

7.3.4 **Marine Strategy Regulations 2010**

In relation to Regulation 9 of the Marine Strategy Regulations 2010 we have had regard to the marine strategy (in so far as it has been developed and published to date) and consider that there is nothing in it which would lead us to any different conclusions from those we have already reached through our other marine assessments.

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 2.2 of this document. The way in

which we have taken account of the representations we have received is set out in Annex 4 of this document. 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) and S3.1(b) in Schedule 3 of the Permit.
45(1)(d)	The permit shall include the requirements for pH, temperature and flow of waste water discharges.	Not applicable
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), S3.3 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 2.3.11 and 2.3.12.
45(2)(a)	The permit shall include a list of the quantities of the different categories of hazardous waste which may be treated.	Not applicable
45(2)(b)	The permit shall include the minimum and maximum mass flows of those hazardous waste, their lowest and maximum calorific values and the maximum contents of polychlorinated biphenyls,	Not applicable

IED Article	Requirement	Delivered by
	pentachlorophenol, chlorine, fluorine, sulphur, heavy metals and other polluting substances.	
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 part 3 of Annex VI.	Conditions 3.1.1 and 3.1.2 and Tables S3.1, S3.1(a) and S3.1(b).
46(2)	Emission into air shall not exceed the emission limit values set out in parts 4 or determined in accordance with part 4 of Annex VI.	Not applicable, this is relevant to co-incinerators.
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/m^3), CO and TOC not to be exceeded during this period.	Conditions 2.3.11 and 2.3.12
47	In the event of breakdown, reduce or close down operations as soon as practicable. Limits on dust (150 mg/m^3), CO	Condition 2.3.11

IED Article	Requirement	Delivered by
	and TOC not to be exceeded during this period.	
48(1)	Monitoring of emissions is carried out in accordance with Parts 6 and 7 of Annex VI.	Conditions 3.2.1, 3.2.2, 3.6.1 to 3.6.4 and Tables S3.1, S3.1(a) and S3.1(b). Reference conditions are defined in Schedule 6 of the Permit.
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, Tables S3.1, S3.1(a), S3.1(b) and S3.4.
48(3)	The competent authority shall determine the location of sampling or measurement points to be used for monitoring of emissions.	Condition 3.6.1 and 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) and S3.1(b).
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 2.3.7, Pre-operational condition PO6, 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 2.3.8
50(4)(a)	Automatic shut to prevent waste feed if at start up until the specified temperature has been reached.	Condition 2.3.7
50(4)(b)	Automatic shut to prevent waste	Condition 2.3.7

IED Article	Requirement	Delivered by
	feed if the combustion temperature is not maintained.	
50(4)(c)	Automatic shut to prevent waste feed if the CEMs show that ELVs are exceeded due to disturbances or failure of waste cleaning devices.	Conditions 2.3.7 and 2.3.11.
50(5)	Any heat generated from the process shall be recovered as far as practicable.	(a) The plant will generate electricity (b) The plant will supply steam to the adjacent Kemsley Paper Mill. Operator to review the available heat recovery options prior to commissioning (Pre-operational 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.
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 me.	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	Condition 2.3.4(a) and Table S2.2 in Schedule 3 of

IED Article	Requirement	Delivered by
	according to the EWC, prior to accepting the waste.	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, the operator shall carry out the procedures set out in Article 52(4).	Not Applicable
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 and 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, 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.	Conditions 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 and 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	Not applicable, there are no such emissions from the Installation.
7	Monitor unburnt substances in slags and bottom ashes	Conditions 3.1.3 and 3.6.1, and Table S3.4.
8	Analysis of hazardous waste	Not applicable as no hazardous waste accepted.
9	Waste stream management techniques	The Application explains the measures that will be used. Permit condition 2.3.1 and Table S1.2 and pre-operational condition PO5.
10	Quality management system for bottom ash treatment plant	Not applicable, bottom ash treatment will not be carried out.
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 and pre-operational condition PO5.
12	Reception, handling and storage of waste	Measures are described in the Application and FPP. Permit condition 2.3.1, pre-operational condition PO10, Tables S1.2 and 3.4.
13	Storage and handling of clinical waste	Not applicable as clinical waste will not be accepted.
14	Improve overall performance of plant including BAT-AELs for TOC or LOI	Techniques described in the Application. Permit conditions 2.3.1, 3.1.3, 3.6.1 and Tables S1.2 and 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 and Table S1.2.
20	Measures to increase energy efficiency and BAT AEEL	Measures described in the Application, Permit condition 2.3.1, and 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, 3.3.1, 3.3.2 and 3.4.1 and Table S1.2. Sections 4.2.2, 6.5.3 and 6.5.4 of this decision document.
22	Handling of gaseous and liquid wastes	Not applicable as gaseous and liquid wastes will not be accepted at the facility.
23	Management system to prevent or reduce dust emissions from treatment of slags and ashes	Not applicable as treatment of slags and ashes is not carried out at the facility.
24	Techniques to prevent or reduce diffuse emissions to air from treatment of slags and ashes	Not applicable as treatment of slags and ashes is not carried out at the facility.
25	Minimisation of dust and metal emissions and compliance with BAT AEL	Section 5.2 of this decision document. Permit conditions 2.3.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2 and Tables S1.2 and S3.1.
26	Techniques and BAT AEL for dust emissions from enclosed slags and ashes treatment	Not applicable as treatment of slags and ashes is not carried out at the facility.

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, 3.1.1, 3.1.2 and Tables S1.2 and S3.1. Section 5.2 of this decision document.
29	Techniques to reduce emissions of NO_2, N_2O, CO and NH_3 and BAT AELs	Measures described in the Application. Permit conditions 2.3.1, 3.1.1 and 3.1.2 and Tables S1.2 and S3.1. Section 5.2 of this decision document.
30	Reduce emissions or organic compounds including dioxins/furans and PCBs. BAT AELs	Measures described in the Application. Permit conditions 2.3.1, 3.1.1 and 3.1.2 and Tables S1.2 and S3.1. Section 5.2 of this decision document.
31	Reduce emissions of mercury. BAT AEL	Measures described in the Application. Permit conditions 2.3.1, 3.1.1 and 3.1.2 and Tables S1.2 and S3.1. Section 5.2 of this decision document.
32	Segregate waste water streams to prevent contamination	Measures described in the Application. Permit conditions 2.3.1, 3.1.1 and 3.1.2 and Tables S1.2 and S3.2. Sections 4.2.2, 6.5.1 and 6.5.3 of this decision document.
33	Techniques to reduce water usage and prevent or reduce waste water	Measures described in the Application. Permit conditions 1.3.1, 2.3.1 and Table S1.2. Sections 4.2.2 and 4.3.8 of this decision document.
34	Reduce emissions to water from FGC and/or from treatment or storage of bottom ashes. BAT AELs	Not applicable as there will be no emissions from flue gas cleaning and the storage and treatment of slags and ash is not carried out.

BAT conclusion	Criteria	Delivered by
35	Handle and treat bottom ashes separately from FGC residues	Permit condition 2.3.13.
36	Techniques for treatment of slags and bottom ashes	Not applicable as no treatment carried out at the facility.
37	Techniques to prevent or reduce noise emissions.	Measures described in the Application. Permit conditions 2.3.1, 3.5.1 and 3.5.2 and Table S1.2. Section 6.5.5 of this decision document.

ANNEX 2: Pre-Operational Conditions

Based on the information in 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 the following to the Environment Agency and obtain the Environment Agency's written approval to the EMS summary and the full OTNOC management plan: A summary of the site EMS. A copy of the full OTNOC management plan which shall be prepared in accordance with BAT 18 of the incineration BAT conclusions. 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.

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
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 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	Prior to the commencement of commissioning, the Operator shall submit a written report to the Agency, and obtain the Environment Agency's written approval to it, detailing the waste acceptance procedure to be used at the site. The waste acceptance procedure shall include the process and systems by which wastes unsuitable for incineration at the site will be controlled. The procedure shall be implemented in accordance with the written approval from the Agency.
PO6	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

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
	monitoring ports to support subsequent validation of these requirements during commissioning.
PO7	At least nine 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 on .gov.uk: • Sampling requirements for stack emission monitoring. • Monitoring stack emissions. • Quality assurance of continuous emissions monitoring systems. 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.
PO8	At least three 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 three months before (or other date agreed in writing with the Environment Agency) the commencement of commissioning, the Operator shall submit detailed drainage plans to the Environment Agency, and obtain the Environment Agency's written approval to them.

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
PO10	At least three months before the commencement of commissioning (or other date agreed in writing with the Environment Agency), the Operator shall submit an updated Fire Prevention Plan to the Environment Agency, and obtain the Environment Agency's written approval to it. The plan shall be written in accordance with the Environment Agency guidance notes on .gov.uk (Fire prevention plans: environmental permits) and our document 'Assessment of a Fire Prevention Plan' sent electronically 5 November 2020. The plan shall be implemented in accordance with the written approval from the Environment Agency.
PO11	At least three months before the commencement of commissioning (or other date agreed in writing with the Environment Agency), the Operator shall submit a Noise Management Plan to the Environment Agency, and obtain the Environment Agency's written approval to it. The plan shall be written in accordance with the Environment Agency guidance notes on .gov.uk (Noise and vibration management plan). The plan shall also include the following: • Mitigation of beat frequencies between the air-cooled condensers by employing controllable frequency fan motors. • Acoustically attenuated louvres. • Operation of the roller shutter doors. The plan shall be implemented in accordance with the written approval from the Environment Agency.
PO12	At least three months before (or other date agreed in writing with the Environment Agency) the commencement of commissioning, the Operator shall confirm the choice of reagent to be used for the SNCR system.

ANNEX 3: Improvement Conditions

Based on 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, 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	Within 4 months of the completion of commissioning

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	updated accordingly.	
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 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 in this permit.	Validation tests completed before the end of 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 Selective Non Catalytic Reduction (SNCR) system and combustion settings to minimise oxides of nitrogen (NOx).The report shall include an assessment of the level of NOx, N_2O and NH_3 emissions that can be achieved under optimum operating conditions. • The lime injection system for minimisation of acid gas emissions. • The carbon injection system for minimisation of dioxin and heavy metal emissions.	Within 4 months of the completion of commissioning

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
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, Pb, Cr (VI), Co, Mn and 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 environmental standard (ES). In the event that the assessment shows that an ES 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 tables S3.1 and 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 Environment Agency within 3 months of completion of commissioning Full summary evidence compliance report to be submitted within 18 months of completion of commissioning

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
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 and bunker area and into the furnace with dead spots minimised. The Operator shall also carry out tests of methods used to maintain negative pressure during shut-down periods to ensure that adequate extraction will be achieved. The Operator shall submit a report to the Environment Agency, for approval, summarising the findings along with any proposed improvements if required.	Within 3 months of completion of commissioning.
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

ANNEX 4: Consultation responses

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 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 12 October 2020 to 09 November 2020. The Application was made available to view at the Environment Public Register at Alchemy House, Bessember Road, Welwyn Garden City, Hertfordshire, AL7 1HE.

The following statutory and non-statutory bodies were consulted:

- Local Authority Environmental Protection Department
- Local Planning Authority / Marine Management
- National Infrastructure Planning
- Food Standards Agency
- Health and Safety Executive
- Public Health England and the relevant Director of Public Health
- Local Fire Service

1) Consultation responses from statutory and non-statutory bodies

Response Received from **Marine Licensing**, Administration Officer, Business Support Team, 12 October 2020	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
To be aware that any works within the Marine area require a licence from the Marine Management Organisation. It is down to the Applicant themselves to take the necessary steps to ascertain whether their works will fall below the Mean High Water Springs mark.	Consultation response sent to the Applicant 14 October 2020.

Response Received from **National Infrastructure Planning**, Case Manager, 13 October 2020	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
The Planning Inspectorate confirmed that they will not be commenting on this application for an environmental permit. At the time of this consultation, the development consent order (DCO) application was in the report writing stage before being sent to the Secretary of State for a decision.	Refer to section 7 above for details relating to the planning/DCO.

Response Received from **Kent Fire & Rescue**, Fire Safety Manager, 06 November 2020	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
The consultation response identified a number of actions relevant to the Applicant which included sharing water supply plans, a site visit and larger scale plans.	Consultation response emailed to Applicant 09 November 2020. We have assessed the Applicant's Fire Prevention Plan as described in section 4.3.4 of this document. A pre-operational condition addresses deficiencies. We highlighted these in an email sent to the Applicant 05 November 2020 available on our public register.

Response Received from **Public Health England**, Principal Environmental Public Health Scientist, 06 November 2020	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
They recommended that reducing public exposures to non-threshold pollutants (such as particulate matter and nitrogen dioxide) below air quality standards has potential public health benefits. They 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 management, and regulation.	Our assessment of environmental impacts is set out in section 5 of this document. For those emissions that do not screen out as insignificant, we are satisfied that there will be no exceedance of an ES. Our assessment of BAT is set out in section 6 of this document. For those emissions that do not screen out as insignificant, we are satisfied with the control measures in place.

Response Received from **Mid Kent Environmental Health Service**, Senior Scientific Officer, 05 November 2020	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
There have been a number of complaints relating to dust, noise and odour allegedly coming from the Kemsley Paper Mill	Our assessment of dust noise and odour is detailed in sections 5.2.2, 6.2.1, 6.5.5 and 6.5.4 of this document. We are satisfied that the necessary controls will be in place. Complaints from the neighbouring facility are not relevant to this determination.
The use of bays for the outdoor storage of some materials. Suggest these are covered and not solely three sided, particularly for the storage of fines, to prevent or mitigate any dust arisings.	In the schedule 5 response received 05 November 2020 the Applicant confirmed that bottom ash storage and loading onto vehicles for off-site treatment, takes place within an enclosed building. They confirm in their email received 25 November 2020 that there will be no external storage areas.
Figure 5.2 of the air quality assessment lists the sensitive receptors. The table should also include St Paul's Street (B2006) which is the closest AQMA area. This area is showing exceedances in both NO_2 (annual mean) and PM_{10} (24 hour mean). The majority of this is from road traffic sources however, the results at St Paul's Street AQMA are significantly higher in comparison to other roadside monitoring sites in the county. This suggests that there are more localised primary sources (i.e. traffic or industrial sources) are affecting the levels of PM_{10} in the area.	Our assessment of this is set out in section 5.2.4 of this document. From the Applicant's model, the PC at all points within each of the AQMAs (including St Paul's Street) is predicted to be well below 1% of the long-term and 10% of the short-term ESs for NO_2 and PM_{10} and can be considered insignificant.
Concerned that the use of Defra's NO_2 background concentration may underestimate the impacts at the receptors sites and hot spot areas such as St Paul's Street. The Defra background concentrations are significantly lower than the levels seen in urban roadside monitoring; therefore the cumulative impacts	We selected appropriate background concentrations for our check modelling and sensitivity analysis. This did not result in any changes to the conclusions drawn by the Applicant and detailed in section 5 of this document. Vehicle access to the Installation and

could be significantly higher than presented in the air quality report. The cumulative effects from stack emissions and traffic generation have been assessed for this site. However, it is unclear of the value inputs for traffic generation.	traffic movements are relevant considerations for the grant of planning permission, but do not form part of the Environmental Permit decision making process for this Application.