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/NP3537YY/A001
The Applicant/Operator is:	Tees Eco Energy Ltd
The Installation is located at:	Billingham Reach EfW

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/NP3537YY/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/NP3537YY. We refer to the permit as "the **Permit**" in this document.

The Application was duly made on 10th August 2017.

The Applicant is Tees Eco Energy Ltd. We refer to Tees Eco Energy Ltd as "the **Applicant**" in this document. Where we are talking about what would happen after the Permit is granted, we call Tees Eco Energy Ltd "the **Operator**".

Tees Eco Energy Ltd's proposed facility is located at Billingham Reach Industrial Estate. We refer to this as "the **Installation**" in this document.

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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	BAT Reference Note
CBA	Cost benefit analysis
CEM	Continuous emissions monitor
CFD	Computerised fluid dynamics
CHP	Combined heat and power
COMEAP	Committee on the Medical Effects of Air Pollutants
COSHH	Control of Substances Hazardous to Health
CROW	Countryside and rights of way Act 2000
CV	Calorific value
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DD	Decision document
EAL	Environmental assessment level
EIAD	Environmental Impact Assessment Directive (85/337/EEC)
ELV	Emission limit value
EMAS	EU Eco Management and Audit Scheme
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154) as amended
ES	Environmental standard
EWC	European waste catalogue
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)
Opra	Operator Performance Risk Appraisal
PAH	Polycyclic aromatic hydrocarbons
PC	Process Contribution
PCB	Polychlorinated biphenyls
PEC	Predicted Environmental Concentration
PHE	Public Health England
POP(s)	Persistent organic pollutant(s)
PPS	Public participation statement
PR	Public register
PXDD	Poly-halogenated di-benzo-p-dioxins
PXB	Poly-halogenated biphenyls

PXDF	Poly-halogenated di-benzo furans
RDF	Refuse derived fuel
RGS	Regulatory Guidance Series
SAC	Special Area of Conservation
SCR	Selective catalytic reduction
SGN	Sector guidance note
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 the Applicant 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.

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 10th August 2017. 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.

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 (Gov.uk Citizen Space https://consult.environment-agency.gov.uk/). Anyone wishing to see these documents could do so and arrange for copies to be made.

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

- Public Health England
- Local Planning Authority – Stockton-On-Tees Borough Council
- Environmental Health – Stockton-On-Tees Borough Council
- Cleveland Fire and Rescue Service
- The National Grid
- The Food Standards Agency
- The Civil Aviation Authority

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. 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 an information notice on 15th December 2017. A copy of the information notice was placed on our public register.

In addition to our information notices, we received additional information during the determination from emails from the Applicant on 26th March 2018, 25th June 2018 and 6th July 2018. We made a copy of this information available to the public in the same way as the response to our information notice.

3. The legal framework

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

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

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

We consider that, in granting the Permit, it will ensure that the operation of the Installation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

We explain how we have addressed specific statutory requirements more fully in the rest of this document.

4. The Installation

4.1 Description of the Installation and related issues

4.1.1 The permitted activities

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

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

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

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

Many activities which would normally be categorised as “directly associated activities” for EPR purposes (see below), such as air pollution control plant, 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. The discharge of spent cooling water is also considered to be a DAA.

4.1.2 The Site

The site for the Installation is located within an industrial setting in the area around Stockton-On-Tees and is adjacent to the River Tees. The site is located on the land of a former power station and is centred approximately on National Grid Reference NZ 47717 21550. The surrounding area is both urban and industrial. It is approximately 1.4km from Billingham, 1.6km from central Middlesbrough and approximately 3.5km from central Stockton-On-Tees. There are numerous sensitive receptors within 1km of the site grid reference. For the site specific assessments, the Applicant has used 14 residential receptors (including schools) to represent the worst case impacts on residential receptors.

The Installation will be within 10km of the Teesmouth and Cleveland Coast Special Protection Areas and Ramsar sites. It will also be within 2km of the SSSI Tees and Hartlepool Foreshore and Wetlands and eight other non-statutory sites (Local Nature Reserves and 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.

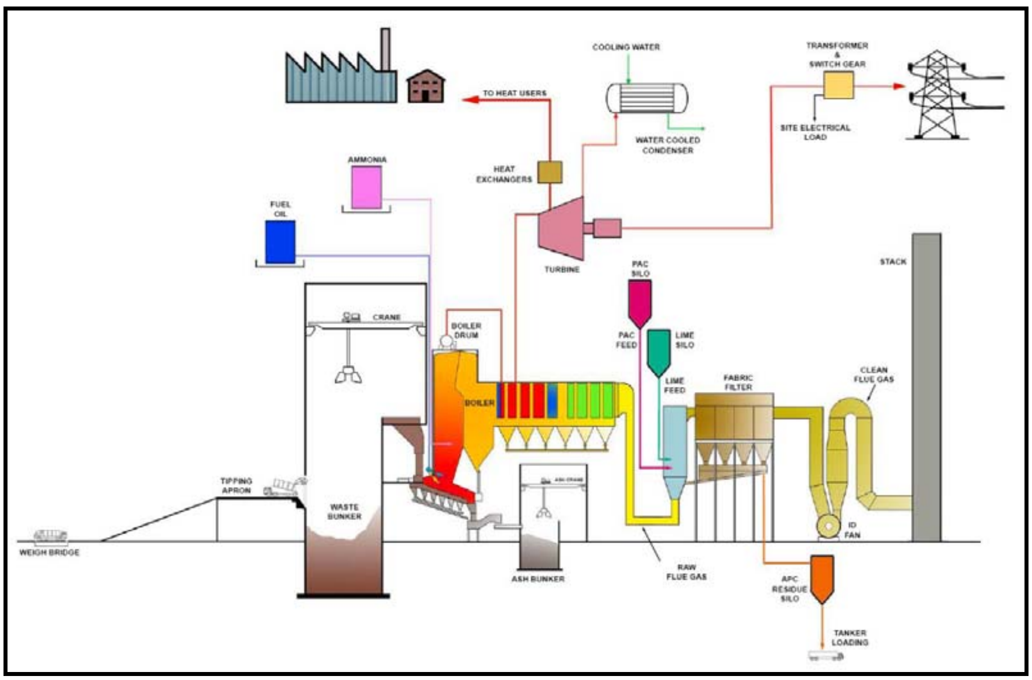
Further information on the site is addressed below at 4.3.

4.1.3 <u>What the Installation does</u>

The Applicant has described the facility as an Energy from Waste Installation. Our view is that for the purposes of IED (in particular Chapter IV) and EPR, the Installation is a waste incineration plant. 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 waste incineration plant is proposed to burn waste comprising predominantly RDF from commercial and industrial sources produced to a fuel specification by waste contractors. The waste incineration plant will produce electrical power for use in the incineration process and other on-site processes, with the remaining electricity being exported to the distribution network. Heat energy generated from the process will not yet be able to be exported to another heat user. However, the Applicant has designed their incineration plant and ancillary equipment to be ‘CHP Ready’. This means that with minimal changes to the plant, the Operator will be capable of supplying steam to an outside heat user.

The main features of the waste incineration plant are summarised below:



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

Waste throughput, Tonnes/line	375,000/annum	45 te/hour
Waste processed	Refuse derived fuel	
Number of lines	1	
Furnace technology	Moving grate	
Auxiliary Fuel	Gas Oil	
Acid gas abatement	Dry	Lime
NOx abatement	SNCR	Ammonia
Reagent consumption	Auxiliary Fuel 2,000 te/annum Ammonia: 500 te/annum Lime: 9,600 te/annum Activated carbon: 100 te/annum	
Flue gas recirculation	Yes	
Dioxin abatement	Activated carbon	
Stack	447725, 521632	
	Height, 80m	Diameter, 2.84m
Flue gas	Flow, 54.22Nm^3/s	Velocity, 15m/s
	Temperature 140°C	
Electricity generated	38MWe	390,300MWh
Electricity exported	34MWe	355,000MWh
Steam conditions	Temperature, 400°C	Pressure, 60 bar
Steam exported	--	--
	--	--
Waste heat use	The Installation will be 'CHP Ready'. Potential heat users have been identified but are not yet viable to be connected. The site is designed so that minimal changes will be needed in order to connect to these potential heat users in future.	

4.1.4 Key Issues in the Determination

The key issues arising during this determination were:

- Water quality
- Emissions to air and impacts on human health and the environment, in particular Special Protection Areas and SSSIs.

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

4.2 The site and its protection

4.2.1 Site setting, layout and history

The Applicant submitted a site condition report which outlined the geology of the site. The geology of the site is as follows;

- Made ground comprising areas of reinforced concrete, sandy and gravely clay and black sand and gravel (including pulverised fuel ash and slag).
- Alluvium comprising of naturally occurring deposits of clay (soft to firm grey-brown clay with variable sand and organic content), sand, silt and peat (brown and fibrous) with a thickness of 2.35m – 12.5m.
- Glacial deposits comprising of naturally occurring deposits of glacial silts and clays (Glacial Till, a stiff, red-brown gravelly clay) and glacial sands and gravel (firm to stiff red-brown sandy silt). This has a thickness of 3.5m – 21m.
- Bedrock formation of Sherwood Sandstone (red, fine to medium grained sandstone). Thickness not proven.

The majority of the site is underlain by a secondary aquifer within the superficial layer (the Glacial Till). Part of the north-west of the site is an unproductive aquifer. The bedrock sandstone is considered to be a principal aquifer. It is noted that the site is not within a Source Protection Zone (SPZ). The closest SPZ is located approximately 8km away.

4.2.2 Proposed site design: potentially polluting substances and prevention measures

The measures the Applicant will implement to prevent pollution to the environment are described in the Supporting Information document submitted with the Application. These are summarised below:

Water run-off

External areas are constructed of impermeable hardstanding with a kerbed containment boundary to prevent any spillage of polluting substances from entering ground and surface water courses. Uncontaminated surface water run-off from the building roof will be diverted to an oil and silt interceptor prior to discharge into the River Tees alongside the cooling water discharge. Tanker off-loading of chemicals will take place on areas of concrete hardstanding with falls directing runoff to a self-contained gully and sump.

Firewater

In a fire event, any firewater generated on the site will be automatically diverted through the drainage system to firewater storage tanks (approximately 1,000 – 1,200m^3. These tanks are subject to further design and a pre-operational measure (PO11f) based on the requirements of the fire prevention plan). A shut-off alarm triggered by the detection system will automatically isolate the site drainage systems.

Spills and leaks; loss of containment; transfer of substances; overfilling of vessels

All storage tanks will be bunded at 110% of the tank capacity and the offloading point will be fully contained to ensure appropriate capacity to capture any spills during fuel or ammonia deliveries. Spillage absorbent materials will be available on-site and positioned nearby to liquid storage locations. As well as secondary containment, storage tanks will be fitted with high level alarms to prevent overfilling.

Management controls

- All chemicals will be handled in accordance with COSHH Regulations.
- Condition 1.1.1 of the permit requires that the scope of the management system shall include measures to minimise the risk of accidents and incidents using competent persons and resources. An accident management plan will be in place prior to the commencement of commissioning.
- The site will routinely inspect tanks, bunds and container vessels to check for damage and/or deterioration.

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 does not adequately describe the condition of the soil and groundwater prior to the start of operations. We have therefore set a pre-operational condition (PO7) requiring the Operator to provide this information prior to the commencement of operations.

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

4.2.3 Closure and decommissioning

Having considered the information submitted in the Application, we are satisfied that the appropriate measures will be in place for the closure and decommissioning of the Installation, as referred to in section 2.11 of the *Supporting Information* document in the Application. Pre-operational condition PO1 requires the Operator to have an Environmental Management System in place before the Installation is operational, and this will include a site closure plan.

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

4.3 Operation of the Installation – general issues

4.3.1 Administrative issues

Tees Eco Energy Ltd is "the Applicant" for the Billingham Reach EfW environmental permit and will have overall management control of the Facility, in accordance with the definition of an Operator as set out in the guidance titled 'Legal operator and competence requirements: environmental permits'. The guidance imposes the following requirements on the Operator:

- *have day-to-day control of the facility or activity, including the manner and rate of operation;*
- *make sure that permit conditions are complied with;*

- *decide who holds important staff positions and have incompetent staff removed, if required;*
- *make investment and financial decisions that affect the facility's performance or how the activity is carried out; and*
- *make sure your activities are controlled in an emergency.*

Tees Eco Energy Ltd will be responsible for all of the above requirements. Tees Eco Energy Ltd will employ a third part contractor to provide day-to-day operation of the site. Tees Eco Energy Ltd are ultimately responsible for the permitted activities.

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.

The incineration of waste is not a specified waste management activity (SWMA). The Environment Agency has considered whether any of the other activities taking place at the Installation are SWMAs and is satisfied that none are taking place.

The Environment Agency's Charging Scheme 2018 will be used as the basis for subsistence and other charging. The Charging Scheme is method of ensuring application and subsistence fees are appropriate and proportionate for the level of regulation required.

4.3.2 Management

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

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

4.3.3 Site security

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

4.3.4 Accident management and fire prevention

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

The Applicant submitted a Fire Prevention Plan (FPP) which we have reviewed. The FPP provided has not been approved under this Application as a number of the operational aspects for the site have not yet been finalised. We have set pre-operational conditions (PO11) in the permit to ensure that where certain areas need developing, a revised FPP will need submitting for the Environment Agency's approval. The Applicant's FPP partially meets the requirements of the Environment Agency's guidance, *Fire prevention plans: environmental permits*. The following sections have been sufficiently addressed:

- Consideration of non-waste materials (section 3)

- Using the fire prevention plan (section 5)
- Arson (section 7.1)
- Plant and equipment (section 7.2)
- Electrical faults (section 7.3)
- Smoking materials (section 7.4)
- Hot works (section 7.5)
- Industrial heaters (section 7.6)
- Hot exhausts (section 7.7)
- Ignition sources (section 7.8)
- Batteries in ELVs (section 7.9 – not applicable)
- Leaks and spillages of oils and fuels (section 7.10)
- Build-up of loose combustible waste (section 7.11)
- Managing storage times (section 8.1)
- Waste bale storage (section 8.3 – not applicable)
- Whole ELVs (section 10.1 – not applicable)
- Waste stored in containers (section 10.2 – not applicable)
- Compost production (section 10.3 – not applicable)
- Separation distances (section 11.1)
- Quarantine area (section 12)

The Installation has not yet been developed and is subject to detailed design. Therefore, it has not been possible to comprehensively assess final proposals for mitigating against fire risk and responding to fire. However, as part of this application, we have assessed the overarching principles of storing and processing large levels of combustible RDF. Where more information is required to ensure that the detailed design proposals are capable of meeting the guidance or alternative methods have been proposed, we have imposed pre-operational conditions (PO11 a – g).

For an alternative measure (to the requirements of the guidance) to be acceptable, the measures must address the aims of the guidance in preventing and mitigating against fire:

- *minimise the likelihood of a fire happening*
- *aim for a fire to be extinguished within 4 hours*
- *minimise the spread of fire within the site and to neighbouring sites*

The sections of the Applicant's FPP which require further assessment via pre-operational conditions are summarised below:

<u>FPP Guidance section 7.12 and 7.13 – Waste acceptance procedures and hot loads</u>

As detailed operational measures are still to be developed on the basis that the Installation is still subject to construction, we did not expect the Applicant to provide this information during the determination of the application.

The guidance requires written procedures to be in place for waste acceptance checks to prevent reactions between incompatible or unstable wastes (i.e. lithium batteries) and demonstrate the site's ability to identify and quarantine hot loads. Section 2.2.2.1 of the Applicant's FPP identifies that documented waste acceptance procedures will be developed in which flammable, explosive and unsuitable waste will be separated. Actions the Applicant will employ include depositing RDF onto the tipping floor hall for visual inspection and using the bunker thermal imaging cameras to identify any wastes with elevated temperatures. Depositing RDF onto the tipping floor may create odour, dust and create contaminated surfaces. The Applicant will inspect and clean the site surfaces to remove dusty build ups and any surface contamination on a weekly basis. Odour will be minimised in the reception area by maintaining negative pressure. Air from the tipping hall will be extracted with the air from the waste bunker as combustion air within the incineration plant. Roller shutter doors will be closed immediately after waste is delivered. The Applicant has committed to developing an odour management plan should odorous emissions be identified off site. Pre-operational measures PO5 and PO11a (see Annex 2 for the pre-operational measure wording) will be imposed to ensure effective written procedures are developed before the site is commissioned.

<u>FPP Guidance section 8.1 – *First-in first-out*</u>

The guidance requires operators to manage their waste so that there is good stock rotation and that a *first-in first-out* process for the management of waste will be in place. This means that older waste must not be buried beneath incoming newer waste and an operator must have recording systems to ensure they can track waste consignments.

The Applicant's FPP indicates that refuse derived fuel wastes will be stored for a maximum period of 4 days in the waste bunker. The bunker will store a maximum of 17,340m^3 at any time and will operate on a *first-in first-out* basis. The bunker will be cleared of waste towards the end of the week as deliveries of waste are reduced. A residual layer of waste will remain in the bunker at the end of this period due the crane grab being unable to easily extract this material. In order to ensure the *first-in first-out* basis is maintained, the crane will form the residual material into piles which is capable of being picked up by the grab. When deliveries recommence at the beginning of the week, the incoming waste will be mixed with the stockpiles of waste which has accumulated during the previous week. This will enable to crane grabs to feasibly deal with the residual materials and prevent it from becoming buried over time. Mixing will take place for 45 minutes every hour to ensure a homogenous mix. This is a feasible approach in order to ensure wastes do not become anaerobic and that residual waste does not remain at the base of the bunker when waste deliveries recommence. To develop this approach into detailed procedures, we have imposed a pre-operational condition, PO11b (see Annex 2 for the pre-operational measure wording) for the provision of a Bunker Management Procedure.

<u>FPP Guidance section 8.2 – Monitor and control temperature & section 13 – Detecting fires</u>

The guidance states that where waste is stored for less than 3 months, temperature monitoring of the waste pile is not typically required. However, as storage of waste in large piles is proposed, the Applicant has proposed a monitoring system which will also be used as a method of detecting fires. Coupled with regular mixing of the waste (45 minutes every hour), there will be multiple thermal imaging cameras installed around the perimeter of the bunker which will automatically scan the pile for elevated temperatures during the mixing process. The mixing will ensure that waste throughout the bunker will be scanned when brought to the surface. The mixing is controlled by the crane operator who is housed within the control room with a 120 minute fire resistant glass partition. Automatic alarms will sound when the thermal imaging cameras identify elevated temperatures. The Applicant has not provided evidence for the setting of these trigger temperatures, however, their FPP commits to reviewing these during detailed design. Following activation of the temperature alarms, the crane operator will locate the waste in question and feed this directly into the hopper or the manual controlled water cannons will be triggered to suppress any elevated temperatures. The crane operators and trained staff will be available 24 hours a day, 7 days a week based on the continuous nature of operations at the site.

The Environment Agency is not satisfied that the level of detail is appropriate to determine that this approach is sufficient at the application stage, therefore, we have set pre-operational measures which require the Operator to submit evidence that the *design, installation and maintenance of the building detection and suppression systems will be covered by an appropriate UKAS accredited third party certification scheme*. The Applicant has already committed to this level of accreditation. This will ensure that the detection and suppression systems will be in-line with our guidance once commissioned.

<u>FPP Guidance section 9.1 – Maximum pile sizes</u>

The maximum pile size required by the FPP guidance is 450m^3. However, the Applicant has proposed to store a maximum of 17,340m3 of RDF within the bunker. This is a clear breach in the FPP guidance requirements, however, the Applicant has proposed alternative methods to ensure that self-heating of this material is minimised. Furthermore, the Environment Agency acknowledges that the incineration of waste sector store large quantities of waste but there is no intention to store waste for prolonged periods. The RDF is a fuel and therefore the aim is to process the material as quickly as possible. The Environment Agency however was concerned that the size of the pile would mean that processing the materials quickly (within 4 days) would not be feasible. We asked the Applicant to demonstrate how this was possible. They provided calculations showing the approximate density of incoming waste and compared this with the feeding rate of 45 tonnes per hour.

Parameter	Unit	Bunker Sizing
Width, w	m	26.2
Length, L	m	30.4
Depth from bunker bottom to bottom of slide	m	7
Depth from bunker bottom to tipping floor, y	m	10
Density of incoming waste (assumed)	kg/m^3	225
Volume, full stacking d = 0 (V1 to tipping floor level, z = 10 m, + V2 in the figure presnete din response to Q12 below)	m^3	17,340
	days	3.6

This equates to approximately 200m^3 per hour based on the Applicant's conversion rate and to clear the 17,340m^3 of waste in the bunker at full capacity will take less than 4 days. On this basis, the risk of deep seated fires becoming established is low. Coupled with the Applicant's regular monitoring, demonstration of achieving first-in first-out and detection systems, we are satisfied that the large pile will not cause additional fire risk. More detail is given for the specific guidance sections below.

FPP Guidance section 14 – Suppressing fires

As with the other aspects of the fire prevention plan proposals, the suppression systems proposed are still subject to further detailed design. The Applicant points towards a sprinkler and deluge systems within the reception area and water cannons within the bunker area. The bunker cannons will operate automatically when the trigger temperature is breached and directed at the waste with elevated temperature. The amount of cannons will be subject to the detailed design.

The Applicant confirms that the suppression system will be in line with the NFPA 850 standard (A US based global fire protection organisation) *Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations*. Furthermore, as stated above, the *design, installation and maintenance of the building detection and suppression systems will be covered by an appropriate UKAS accredited third party certification scheme*. This will be enforced by pre-operational condition PO11d. The Applicant has already committed to this level of accreditation. This will ensure that the detection and suppression systems will be in-line with our guidance once commissioned.

FPP Guidance section 16 – Water supplies

The FPP guidance states that 2,000 litres a minute for 3 hours is required for a 300m^3 pile in order to extinguish a fire. Applying this criteria to the maximum pile size on site of 17,340m^3, the Applicant states that the water required would be approximately 20,800m^3 of water. However, the Applicant has only made provision of a maximum 1,200m^3 firewater tank to be used for the suppression systems in line with the requirements of NFPA 850. The Applicant's principle approach is to tackle any small scale fires through the use of detection, regular turning and being able to quickly respond to wastes with elevated temperatures. The Applicant indicates that if a deep seated fire were to occur, there is the emergency provision of extraction from the River Tees to provide the level of water required by the FPP guidance.

The Environment Agency acknowledges that the level of water needed in line with the guidance is unlikely to be required in full as the waste is stored within an enclosed, impermeable bunker where the used fire water in the bunker will contribute to quenching any fire. However, no evidence or specific calculations in relation to this aspect has been provided. On the basis that fire water supplies can be readily extracted from the River Tees in an emergency, we are satisfied that water is available, however, the practical method of delivering these quantities of water requires more assessment. Therefore, we have imposed pre-operational condition, PO11e requiring the Operator to provide calculations and evidence that enough water is available and capable of extinguishing a fire in the waste bunker.

FPP Guidance section 17 – Managing fire water

The FPP requires that all fire water generated on site as a result of extinguishing a fire and suppression systems is prevented from escaping the site. This is to prevent pollution to surface and groundwater. As the site is subject to a detailed design, the full details on containment systems is not yet available. However, the Applicant's provision for fire water is primarily the waste bunker volume. The bunker itself has a capacity of approximately 8,000m^3. In addition, the remaining footprint of the site is fully impermeable and kerbed to offer a further level of containment. The calculations of required water supplies have not yet been fully developed as the site is subject to greater detailed design. Therefore we have imposed an additional pre-operational measure, PO11f. Following on from the required water supplies, this pre-operational measure requires the Operator to calculate the required containment capacities on site. This will need to be demonstrated before the site is commissioned.

FPP Guidance section 18 – Contingency planning

The primary measures for mitigating against the high fire risk of a very large pile size is the fast turnaround of waste. However, during shut down, it must be demonstrated how fire risk is minimised to prevent stockpiling of combustible materials. The Applicant has confirmed that during planned shut downs, the bunker will be 'nearly empty'. This means that the levels remaining will only be the bottom layer which cannot easily be picked up by the grab (approximately 400m^3 at about 50cm in height). The thermal imaging cameras of the detection system will continue to be utilised during this period in order to identify any elevated temperatures.

In situations of unplanned shut-downs, The Applicant has committed to a maximum of 15 days of storage before this waste would be back loaded out of the bunker and taken off site should the shut-down last for this maximum period. Furthermore, all deliveries of waste will be suspended so waste volumes will not increase. In addition, the bunker mixing procedures will continue at the same rate in order to ensure that any self-heating is identified and dealt with via the suppression systems.

We have imposed pre-operational condition PO11g which requires the Operator to submit detailed shut-down procedures in order to demonstrate that incoming wastes are diverted to alternative sites.

Summary

At this current point, the facility and plant are subject to further detailed design prior to commissioning. Therefore, while the Applicant has mitigated against the risk of self-heating via alternative measures (fast turnaround, first-in first-out, active detection and suppression), we still require a greater level of detail before we can be confident that the Applicant can meet the aims of the FPP guidance. The pre-operational measures will provide the Operator with an appropriate timeframe prior to commissioning to develop the detailed site specific measures.

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	Supporting information of the application document in response to section 3a – technical standards, Part B3 of the application form. Other supporting documents: • Operating techniques document*, Tees Eco Energy Limited; Billingham Reach EfW Supporting Information. Ref. S1652-0200-0007JRS* • *Environmental risk assessment document, Tees Eco Energy Limited; Billingham Reach EfW Environmental Risk Assessment. Ref. S2284-0220-0004JRS* • BAT Statement for acid gas abatement, nitrogen oxides abatement, reagent technology and combustion technology, Tees Eco Energy Limited; Billingham Reach EfW BAT Assessment Report. Ref. S2284-0220-0006JRS	Operating techniques detailing the design and operation of the incineration activities including compliance with relevant IED requirements.
Response to Schedule 5 Notice 15/12/2017	Schedule 5 notice response document with additional information on BAT and operating techniques; Tees Eco Billingham Reach EfW; Schedule 5 Response. Ref. S2284-0230-0001JRS	Details of measures for controlling fire incident resulting from on-site activities. Details of revisions to the noise assessment and revisions to the BAT statements.
Response to request for additional information dated 22/03/2018	Response to email request for information including details on flood risk and fire prevention continuous monitoring for discharge of process water. Email ref. S2284-0210-00223JRS.	Details of measures for mitigating against flood risk.

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
Gas 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 in Section 2.2 of the *Supporting Information* document. The wastes are coded by the European Waste Catalogue (EWC) number, which the Applicant will accept in the waste streams entering the plant and which the plant is capable of burning in an environmentally acceptable way. We have specified the permitted waste types, descriptions and where appropriate quantities which can be accepted at the Installation in Table S2.2.

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

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

The Applicant specified waste codes which are not appropriate for incineration unless supported by justification. These included:

- 15 01 07 – glass packaging
- 17 09 04 – mixed construction and demolition waste
- 19 05 03 – off specification compost
- 19 06 04 – digestate from aerobic treatment of municipal waste
- 19 06 06 – digestate from anaerobic treatment of animal and vegetable waste

Adequate justification was submitted for all of the above with the exception of 15 01 07. Therefore, the Applicant proposed to remove this waste code from the list of wastes in Table S2.2. The waste, 17 09 04 has been restricted to accepting wood and plastics only, in line with the Applicant's justification.

We have limited the capacity of the Installation to 375,000 tonnes per annum. This is based on the Installation operating 8,000 hours per year at a nominal capacity of 45 tonnes per hour. The site will have a nominal design capacity of approximately 360,000 tonnes per annum based on an operating capacity of 45 tonnes per hour of RDF and a nominal calorific value of 10 MJ/kg. The maximum capacity of 375,000 has been accepted to account for variations in the net calorific value of fuels (between 8 MJ/kg – 13.4 MJ/kg) and the potential for the plant to run for more than the typical 8,000 hours per 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:

- 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.
- 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.

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

- Housekeeping and maintenance procedures to ensure efficient operation.
- Plant condition monitoring on a regular basis. Ensure motors operating efficiently, insulation and cladding are in good repair and leak detection.
- Boilers will be equipped with economisers and superheaters to optimise thermal cycle efficiency.
- Low grade heat will be extracted from the turbine and used to preheat combustion air to improve the efficiency of the thermal cycle.
- Boiler heat exchange surfaces will be cleaned on a regular basis to ensure efficient heat recovery.
- An energy efficiency plan will be built into the operation and maintenance procedures.

The Application states that the specific energy consumption, a measure of total energy consumed per unit of waste processed, will be 90 kWh/tonne. The Installation capacity is 375,000 t/a.

Data from the BREF for Municipal Waste Incinerators shows that the range of specific energy consumptions is as in the table below.

MSWI plant size range (t/yr)	**Process energy demand (kWh/t waste input)**
Up to 150,000	300 – 700
150,000 – 250,000	150 – 500
More than 250,000	60 – 200

The BREF says that it is BAT to reduce the average Installation electrical demand to generally below 150 kWh/tonne of waste with an LCV of 10.4 MJ/kg. The LCV in this case is expected to be between 8 MJ/kg – 13.4 MJ/kg (10 MJ/kg used in design calculations). Taking account of the difference in LCV, the specific energy consumption in the Application is in line with that set out above.

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

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

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

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

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

The BREF says that where a plant generates electricity only, it is BAT to recover 0.6 – 1.0 MWh/tonne of waste (based on LCV of 15.2 MJ/kg) for pre-treated wastes. 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, but could also provide heat in the form of steam for other processes and customers. The electrical output of the plant will be 34 MW. This is equivalent to 10.6 MW per 100,000 tonnes of waste (0.76 MWh/tonne of waste burned). Heat generated after commissioning will not be immediately available for export to customers and other heat users. However, the Installation has been designed to be CHP ready.

The Applicant provided a CHP ready assessment, *Tees Eco Energy Limited. Billing Reach EfW Facility Heat Plan* and addendum as part of a Schedule 5 notice response; *TeesEco Billingham Reach EFW, Schedule 5 Response* (responses to questions 29, 30 and 31). This assessment includes a CBA of providing heat to several potential heat users; Stockton Borough Council (SBC) district heating system (*SBC Green Vision*) and a fertiliser manufacturer, CF Fertilisers UK Limited (CFI). These CBAs conclude that both the SBC scheme and CFI are not economically viable in the current configuration.

Key aspects in providing heat to the fertiliser manufacturer are not known (steam conditions, demand profile and potential for condensate return to the site). These unknowns mean that assumptions have been made in the CBA. For example, the Applicant assumes that CFI is capable of accepting 100% low pressure steam, the resulting loss in net present value of the specified 33 years would be greater than the losses posed by the SBC scheme. CFI would be a steam consumer and unlike the SBC, which is a hot water consumer and because the potential for condensate return is unknown it could mean large quantities of make-up water is required. In addition, the feasibility of routing steam pipework above ground over 1km on land outside of the Applicant's control presents additional challenges in respect of consenting, safety, security and asset protection. However, the Applicant will continue to work with CFI in future to reduce these uncertainties and consider any opportunities to supply steam in line with the EA guidance, *CHP Ready Guidance for Combustion and Energy from Waste Power Plants*. Therefore at this stage, it cannot be concluded that connections with CF Fertilisers UK Limited would be a feasible option.

On the other hand, the Applicant states that while the SBC scheme is not economically viable, the Installation would be able to provide hot water which meets the requirements of all identified heat consumers (approximately 75,000 MWh of heat which the SBC has advised it intends to purchase). Despite this, peak loads will not be able to be met by the Installation alone, but the SBC scheme are seeking to install 300 MWth of thermal storage to lessen the demand profile of peak loads. Therefore, the Applicant concludes that while not economically viable at present, the plant will be designed to ensure that with minimal modification, the plant will seek to supply heat to realise CHP in the future. In order for the scheme to be economically viable, the heat sale price would need to increase by 75%. It is acknowledged that price fluctuations are out of the control of the Applicant but it is possible to provide the heat in future. The Applicant will design the plant so that connection to the network would be at an interface point at the southern edge of the site boundary. Pre-insulated buried pipework will be routed along the existing public highway with a pipe length of 0.3km.

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. 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. In our role as a statutory consultee on the planning application, we ensured that the issue of energy utilisation was brought to the planning authority's attention. We have made comments about this to Stockton Borough Council (the planning authority) in our role as a statutory consultee for the planning application.

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/or 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 ROC and RHI schemes is not a consideration in determining this application.

(v) Choice of Steam Turbine

The steam from the boiler will feed a steam turbine generator used to generate electricity. In fully condensing mode, the steam turbine will generate 38MW with 34MW exported to the national grid. Steam extracted can also be used for generating hot water for the SBC district heating network of 120°C and return water temperature of 50°C to 80°C. It is estimated that 20 tonnes/hour of steam is available at an extraction pressure of 4.24 bar. This method of heat generation (heat extraction from the steam turbine) is preferred to other techniques as the heat requirements of the potential heat users are suited to the temperatures achievable from the turbine with minimal power loss due to exporting heat. Also, extraction of steam from turbines offers the most flexible approach for varying heat demands should heat user options change. This is more appropriate for sites developed as CHP ready.

(vi) Choice of Cooling System

The Applicant has designed the Installation cooling system to be a 'once through' water cooling process. Water will be extracted from the River Tees to condense steam from the turbine so that it can be returned to the boiler. The cooling water will then be discharged back to the River Tees at the same rate of abstraction. The Installation will be located on a tidal river with appropriate water supplies, the alternative cooling systems (e.g. air cooling) are less appropriate in this instance as cooling water provides more consistent temperatures with seasonal temperature fluctuations. Additionally, coastal locations can cause pitting and rotting of fans of air cooled condensers. A detailed environmental impact assessment was submitted by the Applicant to determine the impact of cooling water on the River Tees. This is discussed in section 5. We consider the chosen technology to be appropriate.

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

The Applicant submitted a cost-benefit assessment of opportunities for high efficiency co-generation within 15 km of the Installation in which they calculated net present value. If the NPV is positive (i.e. any number more than zero) it means that the investors will make a rate of return that makes the scheme commercially viable. A negative NPV means that the project will not be commercially viable. The Applicant’s assessment showed a net present value of -1.58 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 Installation.

(viii) Permit conditions concerning energy efficiency

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

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

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

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

4.3.8 Efficient use of raw materials

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

The Operator is required to report with respect to raw material usage under condition 4.2 and Schedule 5, including consumption of lime, activated carbon and 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, air pollution control residues and recovered metals.

The first objective is to avoid producing waste at all. Waste production will be avoided by achieving a high degree of burnout of the ash in the furnace, which results in a material that is both reduced in volume and in chemical reactivity. Condition 3.1.3 and associated Table S3.5 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.

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

In order to ensure that the IBA residues are adequately characterised, pre-operational condition PO3 requires the Operator to provide a written plan for approval detailing the ash sampling protocols. Table S3.5 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. The Applicant is currently investigating options for the use of bottom ash in road construction.

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.

5. Minimising the Installation's environmental impact

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

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

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

5.1 Assessment Methodology

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

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

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

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

5.1.2 Use of Air Dispersion Modelling

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

Once short-term and long-term PCs have been calculated in this way, they are compared with Environmental Standards (ES).

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 considered Insignificant if:

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

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

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

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

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions; and
- 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 air quality assessment document, *1986-01 Billingham Reach ES Addendum and appendices.* 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 and conservation sites.

In June 2018, the Applicant provided a revised air quality assessment. This is due to an increase in expected volumetric flows which were modelled in the above report. The revised assessment is titled, *Billingham Reach Biomass Plant. Volume 1A: Addendum Main Report* plus the relevant appendices.

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.

The Applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on local air quality from the Installation's stack emissions using the ADMS 5.2 dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model used 5 years of meteorological data collected from the weather station at Durham Tees Valley Airport between 2011 and 2015. This meteorological station is approximately 13km to the south-west of the site. The impact of the terrain surrounding the site upon plume dispersion was considered in the dispersion modelling.

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

- First, they assumed that the ELVs in the Permit would be the maximum permitted by Article 46(2) and Annex VI of the IED. These substances are:
  - Oxides of nitrogen (NO_x), expressed as NO_2.
  - Total dust.
  - Carbon monoxide (CO).
  - Sulphur dioxide (SO_2).
  - Hydrogen chloride (HCl).
  - Hydrogen fluoride (HF).
  - Metals (Cadmium, Thallium, Mercury, Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel and Vanadium).
  - Polychlorinated dibenzo-para-dioxins and polychlorinated dibenzo furans (referred to as dioxins and furans).
  - Gaseous and vaporous organic substances, expressed as Total Organic Carbon (TOC).
- Second, they assumed that the Installation operates continuously at the relevant long-term or short-term ELVs, i.e. the maximum permitted emission rate (except for emissions of arsenic, chromium and nickel, which are considered in section 5.2.3 of this decision document).
- Third, the model also considered emissions of pollutants not covered by Annex VI of IED, specifically ammonia (NH_3), 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 5.2.5.

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

The Applicant has carried out background air quality monitoring to augment the data available from local authority monitoring. 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. The Applicant has used background pollutant concentrations from a variety of data sources including; project specific monitoring, local continuous monitoring, Defra modelled background maps, UK heavy metals and polycyclic aromatics networks, acid gas and aerosol network and toxic organic pollutants network.

Based on the location of the site, the Applicant has selected background data which is of a reasonably conservative nature as it includes sources from more polluted background areas, such as Middlesbrough AQMA.

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 predictions are summarised in the tables below. 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. Whilst we have used the Applicant's modelling predictions in the table below, we have made our own simple verification calculation of the percentage process contributions and predicted environmental concentrations. 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.

Table 5.1 – Predicted impacts to air from the Installation at point of maximum impact (non-metal pollutants)

Pollutant	EQS/EAL	Background	Process contribution (PC)		Predicted environmental concentration (PEC)	
	µg/m³	µg/m³	µg/m³	% of EAL	µg/m³	% of EAL
NO_2	[1]40	25	2.49	6.2	27.49	68.7
	[2]200	50	32.62	16.3	82.62	41.3
PM_{10}	[1]40	19.9	0.18	0.4	20.8	50.2
	[3]50	39.8	0.63	1.3	40.43	80.9
$PM_{2.5}$	[1]25	12.9	0.18	0.7	13.08	52.3
SO_2	[4]266	9	49.84	18.7	58.84	22.1
	[5]350	9	46.32	13.2	55.32	15.8
	[6]125	9	7.36	5.9	16.36	13.1
HCl	[7]750	1.42	14.56	1.9	15.98	2.1
HF	[8]16	2.35	0.02	0.1	2.37	14.8
	[7]160	4.7	0.97	0.6	5.67	3.5
CO	[9]10,000	764	35.5	0.4	799.50	8
VOC[1]	[1]2.25	0.32	0.18	7.9	0.5	22.1
VOC[2]	[1]3.25	1.5	0.18	3.6	1.68	33.6
	[7]195	3	4.85	2.5	7.85	4
PAH	[1]0.00025	0.00049	1.87E-6	0.7	0.00049187	197.7
NH_3	[1]180	2.5	0.18	0.1	2.68	1.5
	[10]2500	5	2.43	0.1	7.43	0.3
PCBs	[1]0.2	0.12746	0.00009	0.04	0.12755	63.8
	[10]6	0.25492	0.00121	0.02	0.25613	4.3
Dioxins		3.3E-08	1.78E-09		3.478E-08	

Notes

VOC[1] as 1, 3 butadiene
VOC[2] as benzene
PAH as benzo[a]pyrene
[1] Annual mean
[2] 99.79th percentile of 1 hour means
[3] 90.41st percentile of 24 hour means
[4] 99.9th percentile of 15 minute means
[5] 99.73rd percentile of 1 hour means
[6] 99.18th percentile of 24 hour means
[7] 1 hour average
[8] monthly average
[9] maximum daily running 8 hour mean
[10] 1 hour maximum

Table 5.2 – Predicted impacts to air from the Installation at point of maximum impact (metal pollutants)

Pollutant	**EQS/EAL**	**Background**	**Process contribution (PC)**		**Predicted environmental concentration (PEC)**	
	$\mu g/m^3$	**$\mu g/m^3$**	**$\mu g/m^3$**	**% of EAL**	**$\mu g/m^3$**	**% of EAL**
Cd (and Tl)	[2]1.5	0.00083	0.00089	17.8	0.00172	34.4
Hg	[1]0.25	0.0201	0.00089	0.4	0.0209	8.4
	[2]7.5	0.04002	0.01213	0.2	0.05215	0.7
Sb	[1]5	--	0.000205	0.004	--	--
	[2]150	--	0.00279	0.002	--	--
Pb	[1]0.25	0.022	0.000896	0.36	--	9.16
Co		0.0006	0.0001		--	
Cu	[1]10	0.0193	0.000517	0.005	--	0.20
	[2]200	0.0386	0.00704	0.004	--	0.02
Mn	[1]0.15	0.02831	0.001069	0.71	--	19.59
	[2]1500	0.05662	0.01456	0.001	--	0.005
V	[1]5	0.00266	0.000107	0.002	--	0.06
	[3]1	0.00532	0.00146	0.15	--	0.68
As	[1]0.003	0.00081	0.000445	14.85	0.001255	41.85
Cr (II)(III)	[1]5	0.012	0.001639	0.03	--	0.27
	[2]150	0.024	0.02232	0.01	--	0.03
Cr (VI)	[1]0.0002	0.0024	0.000002	1.16	0.002402	1201.16
Ni	[1]0.02	0.00865	0.003919	19.60	0.012569	62.85

Notes

[1]Annual mean
[2]1 hour maximum
[3]24 hour maximum

Screening out emissions which are insignificant

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

- Long term environmental standards (annual mean); PM_{10}, $PM_{2.5}$, ammonia, PCBs, mercury, antimony, lead, copper, manganese, vanadium, chromium, chromium (VI), PAH and hydrogen fluoride (monthly average).
- Short term environmental standards; PM_{10} (24 hour mean) Sulphur dioxide (24 hour mean), hydrogen fluoride (1 hour average), carbon monoxide (running 8 hour mean), hydrogen chloride (1 hour average), ammonia (1 hour maximum), PCB (1 hour maximum), mercury (1 hour maximum), antimony (1 hour maximum), copper (1 hour maximum), manganese (1 hour maximum), vanadium (24 hour maximum) and Chromium (1 hour maximum).

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.

Emissions unlikely to give rise to significant pollution

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

- Long term environmental standards (annual mean); nitrogen oxides (expressed as NO_2), VOC (as 1, 3 butadiene), VOC (as benzene), arsenic, cadmium and thallium (combined emission) and nickel.
- Short term environmental standards: nitrogen oxides (expressed as NO_2, 1 hour mean) and sulphur dioxide (15 minute mean and 1 hour mean), cadmium and thallium (combined emission 1 hour maximum).

The Applicant's air quality does not assess the long term impact of cadmium issues. This is a requirement under the IED and has an emissions benchmark of 0.005 µg/m^3 with an annual mean emissions period. The Applicant instead considered the short term impact of cadmium. Despite this omission, our sensitivity checks of the model show that projected impacts of the annual mean cannot be screened as insignificant. However, when considered against the background concentration, our checks of the PEC are well under the environmental standard. We therefore agree with the Applicant that emissions from cadmium are 'not significant'.

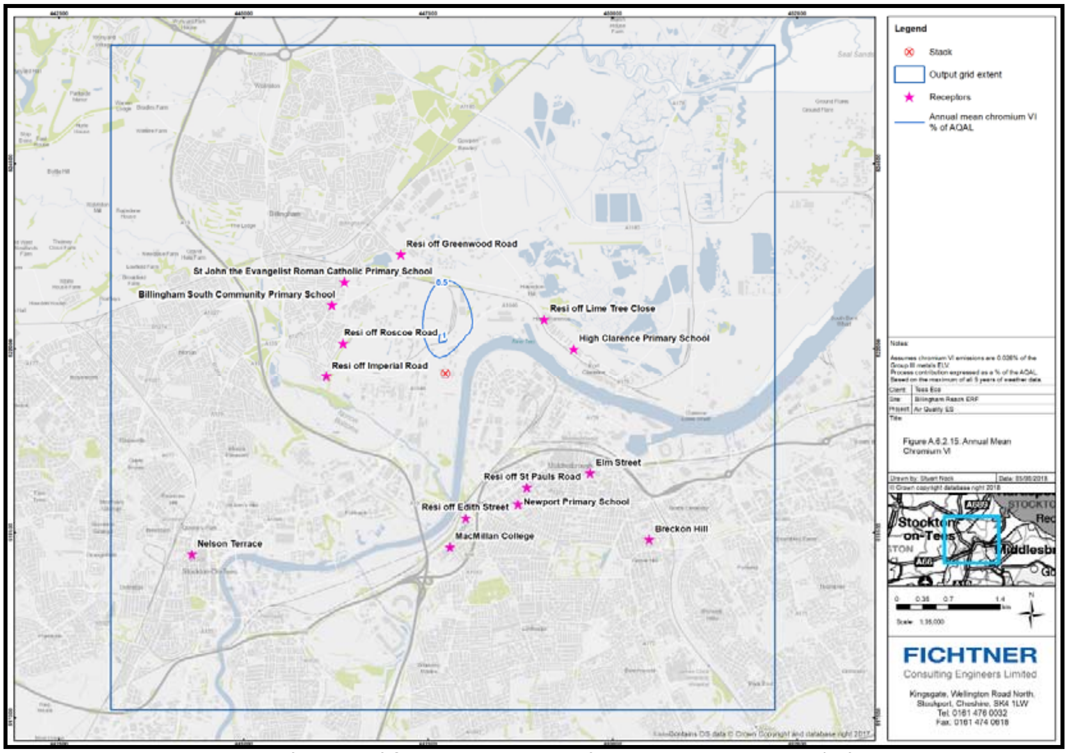
For these emissions, we have carefully scrutinised the Applicant's proposals to ensure that they are applying the Best Available Techniques to prevent and minimise emissions of these substances. This is reported in section 6 of this document.

Emissions requiring further assessment

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

Chromium (VI) (annual mean)

The Applicant acknowledges that emissions of Chromium (VI) solely from the Installation exceed the 1% insignificance threshold at limited locations from the model. *Figure A.6.2.15* of the revised air quality assessment shows that the area where impacts are greater than 1% is restricted to a small area. The impact at all areas of relevant exposure where members of the public may be expected to spend prolonged period are below 1% of the environmental standard. We therefore agree with the Applicant that the impact on members of the public from emissions of metals can be considered as insignificant for Chromium (VI).



Isopleth map showing the likely footprint of Chromium VI impacts from the Installation as a % of the annual mean environmental standard.

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

We have also carefully considered whether additional measures are required above what would normally be considered BAT in order to prevent significant pollution. Consideration of additional measures to address the pollution risk from these substances is set out in section 5.2.4.

5.2.2 Consideration of key pollutants

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 above the level that would screen out as insignificant (>10% of the ES). However it is not expected to result in the ES being exceeded.

Particulate matter PM_{10} and $PM_{2.5}$

The impact on air quality from particulate emissions has been assessed against the ES for PM_{10} (particles of 10 microns and smaller) and $PM_{2.5}$ (particles of 2.5 microns and smaller). For PM_{10}, the ES are a long term annual average of 40 $\mu g/m^3$ and a short term daily average of 50 $\mu g/m^3$. For $PM_{2.5}$ the ES of 25 $\mu g/m^3$ as a long-term annual average to be achieved by 2010 as a Target Value and by 2015 as a Limit Value has been used.

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

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

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

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

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

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

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. While 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 (IC2) 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.

Acid gases, SO_2, HCl and HF

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

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

Emissions of SO_2 can also be screened out as insignificant in that the short term process contribution (24 hour mean) is less than 10% of the ES value. While SO_2 emissions cannot be screened out as insignificant (for the short term ES, 15 minute means and 1 hour means), 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. We are satisfied that SO_2 emissions will not result in significant pollution.

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

The above tables show that for VOC (for both 1,3 butadiene and benzene) 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 and benzene 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 peak short term PC for CO is less than 10% of the ES and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of this substance to be BAT for the Installation.

The above tables show that for PAH emissions, the peak long term PC is less than 1% of the ES and therefore can be screened out as insignificant. The Applicant has also used the ES for benzo[a]pyrene (BaP) for their assessment of the impact of PAH. We agree that the use of the BaP ES is sufficiently precautionary. While, the PEC is predicted to be 197% of the ES, as stated in section 5.2.1 (iii) above and through our audit of the Applicant's modelled data, the Environment Agency is satisfied that the Installation's impact from BaP does not indicate a likelihood of a significant contribution to any background exceedances. The Applicant's modelled concentration was based on the Environment Agency's highest recorded emission concentration for BaP. It is unlikely that this facility will operate to these levels.

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 the emissions of these substances to be BAT for the Installation.

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

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

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

Summary

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

5.2.3 Assessment of Emission of Metals

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

Annex VI of IED sets three limits for metal emissions:

- An emission limit value of 0.05 mg/m^3 for mercury and its compounds (formerly WID group 1 metals).
- An aggregate emission limit value of 0.05 mg/m^3 for cadmium and thallium and their compounds (formerly WID group 2 metals).
- An aggregate emission limit of 0.5 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:

- Long term environmental standards (annual mean): Mercury, antimony, lead, copper, manganese, vanadium and chromium.
- Short term environmental standards (1 hour maximum): Mercury, antimony, copper, manganese, chromium and vanadium (24 hour maximum).

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

Where Annex VI of the IED 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 metals; cadmium, arsenic and nickel, 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".

The following emissions of metals whilst not screened out as insignificant were assessed as being unlikely to give rise to significant pollution:

- Long term environmental standards (annual mean): Cadmium, arsenic and nickel.

The 2009 report of the Expert Panel on Air Quality Standards (EPAQS) – "Guidelines for Metal and Metalloids in Ambient Air for the Protection of Human Health", sets non statutory ambient air quality guidelines for Arsenic, Nickel and Chromium (VI). These guidelines have been incorporated as ESs in our guidance 'Air emissions risk assessment for your environmental permit'

Chromium (VI) is not specifically referenced in Annex VI of IED, which includes only total chromium as one of the nine Group 3 metals, the impact of which has been assessed above. The EPAQS guidelines refer only to that portion of the metal emissions contained within PM_{10} in ambient air. The guideline for chromium (VI) is 0.2 ng/m^3.

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. We have considered the concentration of total chromium and chromium (VI) in the APC residues collected upstream of the emission point for existing Municipal Waste incinerators and have assumed these to be similar to the particulate matter released from the emission point. This data shows that the mean Cr(VI) emission concentration (based on the bag dust ratio) is $3.5 * 10^{-5}$ mg/m^3 (max $1.3 * 10^{-4}$).

There is little data available on the background levels of Cr(VI). Taking a precautionary approach we have assumed that the background level already exceeds the ES. The Applicant has used the above data to model the predicted Cr(VI) impact. The PC is predicted as 1.16% of the EAL. This assessment shows that emissions of chromium (VI) do not screen out as insignificant. However, as stated in section 5.2.1 (iii), we agree with the Applicant's conclusions that impacts of chromium (VI) above 1% are at locations where members of the public are very unlikely to be for prolonged periods. 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

Impact on Air Quality Management Areas (AQMAs)

No Air Quality Management Areas (AQMAs) have been declared within an area likely to be affected by emissions from the incinerator.

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:

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 include the application of BAT, which may in some circumstances dictate tighter emission limits and controls than those set out in 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.

Environmental Impact Assessment

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

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."

The European Integrated Pollution Prevention and Control Bureau stated in the Reference Document on the Best Available Techniques for Waste Incineration August 2006 "European health impact assessment studies, on the basis of current evidence and modern emission performance, suggest that the local impacts of incinerator emissions to air are either negligible or not detectable."

HPA (now PHE) in 2009 states 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 January 2012 PHE confirmed they would be undertaking a study to look for evidence of any link between municipal waste incinerators and health outcomes including low birth weight, still births and infant deaths. Their current position that modern, well run municipal waste incinerators are not a significant risk to public health remains valid. The study will extend the evidence base and provide the public with further information

Policy Advice from Government also points out that the minimal risk from modern incinerators. Paragraph 22 (Chapter 5) of WS2007 says that "research carried out to date has revealed no credible evidence of adverse health outcomes for those living near incinerators." It points out that "the relevant health effects, mainly cancers, have long incubation times. But the research that is available shows an absence of symptoms relating to exposures twenty or more years ago when emissions from incinerators were much greater than is now the case." Paragraph 30 of PPS10 explains that "modern, appropriately located, well run and well regulated waste management facilities should pose little risk to public health."

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.

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 million millionths (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.

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

Receptor	**adult**	**child**
Residential point of maximum impact	0.04%	0.13%
Agricultural point of maximum impact	2.10%	2.95%

Calculated maximum daily intake of dioxins by local receptors resulting from the operation of the proposed facility (I-TEQ/ kg-BW/day)

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 0.3µm, 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 0.3µm and much of what is smaller. It is not expected that particles smaller than 0.3µm 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 0.1µm 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 $PM_{0.1}$.

This is consistent with the assessment of this application which shows emissions of PM_{10} to air to be insignificant.

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

5.3.4 Assessment of Health Effects from the Installation

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

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

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

As stated in the section above (5.2.1, 5.3.2 and 5.3.3), the Applicant's assessment of the impact from the airborne pollutants have all indicated that the Installation emissions screen out as insignificant or where the impact of emissions have not been screened out as insignificant, the assessment still shows that the predicted environmental concentrations are well within air quality standards or environmental action levels.

The Environment Agency has reviewed the methodology employed by the Applicant to carry out the health impact assessment. We carried out check modelling for human intake of dioxins and furans using empirical calculations. The Applicant's predicted maximum intake assumes that the person lives at the point of maximum impact and consumes home-grown produce. The Applicant's consider this to be a very worst-case scenario. They present their maximum predicted PC intake and overall intake (including MDI) as a % of the Committee on Toxicity (COT) Tolerable Daily Intake13 (TDI) of 2 pgWHO-TEQ/kg(BW)/day, is reported in table 11 of the HHRA. It is their predicted PC in Table A.6.3.2 rather than the MDI prediction that is relevant in comparison with the TDI (as a lifetime exposure). We have focused on this prediction.

For adults they predict an impact of 2.10% of the TDI. For children the maximum impact is predicted to be 2.95% of the TDI.

The consultant concludes that the maximum predicted PC intake as a % is below the TDI "therefore, would not be an appreciable health risk based on the emission of these pollutants".

The assessment methodology has deliberately used assumptions to generate scenarios that will lead to overestimations of the risk to human health. We agree that this is an appropriate and conservative approach. We have conducted our own HHRA screening checks using the US EPA HHRAP method and our own dispersion modelling checks.

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 and it concluded that it is unlikely that there will be any unacceptable effects on the human food chain as a result of the operations at the Installation. Details of the responses provided by Public Health England to the consultation on this Application can be found in Annex 2.

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

The following Habitats (Special Areas of Conservation, Special Protection Areas and Ramsar) sites are located within 10Km of the Installation:

- Teesmouth and Cleveland Coast SPA
- Teesmouth and Cleveland Coast Ramsar

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

- Tees and Hartlepool Foreshore and Wetlands SSSI

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

- Billingham Beck Valley Local Nature Reserve
- Charlton's Pond Local Nature Reserve
- Portrack Marsh Local Wildlife Site
- Portrack Meadows Local Wildlife Site
- Billingham Norton Bottoms Reedbed Treatment Systems Local Wildlife Site
- Norton Bottoms Local Wildlife Site
- Billingham Beck Valley Country Park Local Wildlife Site
- Teessaurus Park Local Wildlife Site

Habitats Assessment

The Applicant's Habitats assessment was reviewed by the Environment Agency's technical specialists for modelling, air quality and marine modelling who agreed with the assessment's conclusions, that there would be no likely significant effect on the interest features of the protected sites. Natural England were consulted and also agreed with these conclusions.

5.4.2 Impacts on European Sites

The Applicant's assessment does not consider the most sensitive habitat of the SPA (Teesmouth and Cleveland Coast) which is sensitive to nitrogen deposition. The Applicant's impact assessment for the SPA features is based on the closest point to the emission source and the less sensitive habitat type, Littoral sediments with the critical load (CLo) class (according to APIS) of 'Pioneer, low-mid, mid-upper saltmarshes'. Instead the most sensitive habitat to nitrogen deposition are the 'Supralittoral sediments (acidic type)'. The following summary provides a breakdown of the modelled emissions from the site and their impact on the SPA habitats.

Impacts from NO_x, SO_2, NH_3 and HF concentrations

Pollutant	ES	Background	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
Unit	**µg/m³**	**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
NO_x annual mean	30	19.77	0.85	2.8	20.62	88.97
NO_x 24 hour mean*	75	39.54	5.2	6.9	--	--
SO_2 annual mean	20[1]	3.88	0.21	1.1	4.09	20.5
NH_3 annual mean	3[2]	1.77	0.04	1.4	1.81	60.4
HF 24 hour mean*	5	4.70	0.026	0.52	--	--
HF weekly mean	0.5	4.70	0.011	2.2	--	--

**Short term background is calculated by applying a factor of 2 to long term background concentrations*

[1[A critical level of 20 µg/m³ was applied. The Applicant should have applied a critical level of 10 µg/m³. This is a worst case benchmark should lichens and bryophytes be present

[2]A critical level of 3 µg/m³ was applied. APIS indicates that this is the appropriate benchmark for the most sensitive habitat

The table above clearly shows that some substances are less than 1% (annual mean) or 10% (short term mean) of the critical level and can therefore be considered insignificant (NO_x short term, and HF short term). However, the modelled PCs from the proposed project for NO_x (annual mean), ammonia (annual mean) and SO_2 (annual mean) are greater than 1% of the critical load. We have therefore considered the modelled PC and background concentrations to check the PECs. As shown in the table, all pollutants are less than 100% of the critical level.

We can therefore conclude that the above emissions are either *insignificant* or *not significant*. As part of our detailed audit, we do not necessarily agree with the figures presented in the report and displayed in the table above, however after undertaking our own sensitivity assessment we do agree with the Applicant's conclusions.

Impacts from acidification

CLo (keq/ha/yr)	Baseline deposition rates (keq/ha/yr)	PC (keq/ha/yr)	Total PC (keq/ha/yr)	PC % of ES	PEC (keq/ha/yr)	PEC % of ES
1.56 MinCLmaxS	0.36	0.0436	0.0655	3.28	1.626	81.4
1.998 MinCLmaxN	1.2	0.0219				
0.438 MinCLminN						

The air quality assessment considers acid deposition and concludes that the PC will be greater than 1% as shown in the table above. However, the Applicant has applied an incorrect set of CLos. The benchmarks were selected for the closest SSSI (Tees and Hartlepool Foreshore and Wetlands) which falls within the footprint of the SPA. However, the most sensitive habitat in the SPA to acid deposition are *supralittoral sediments*, as outlined on APIS. CLos for this habitat consist of the following:

- MinCLminN – 0.223 keq/ha/yr
- MinCLmaxS – 1.560 keq/ha/yr
- MinCLmaxN – 1.998 keq/ha/yr

APIS outlines how we should consider the impacts on the relevant protected site from acid deposition.

> *It is necessary to account for “background” deposition and consider whether the process under assessment results in a worsening of exceedance, or whether it moves a site from non-exceedance to exceedance, and by how much. To do this, the agencies consider the process contribution (PC) and predicted total deposition (equivalent to the concept of PEC) as a proportion of the critical load function.*
>
> *It is important that the combined effects of the inputs of sulphur and nitrogen are considered. Therefore, the total acidity inputs need to be compared to the critical load function, rather than considering the individual components against CLmaxS and CLmaxN.*
>
> *…The potential impacts of additional sulphur and/or nitrogen deposition from a source are partly determined by PEC, because only if PEC of nitrogen deposition is greater than CLminN will the additional nitrogen deposition from the source contribute to acidity. Consequently, if PEC is less that CLminN only the acidifying effects of sulphur from the process need to be considered.*

As the background concentration of nitrogen is greater than the critical load (CLminN), sulphur deposition is considered. The combined sulphur and nitrogen deposition rates are then compared against the *critical load function* ((PC of Sulphur+Nitrogen deposition)/CLmanN)*100).

Using the correct CLos, our sensitivity checks show that the combined nitrogen and sulphur deposition PC is likely to be approximately 3% of the critical load function. The annual impact is greater than 1% of the CLo, therefore, the impact is not *insignificant*. Using the background concentration at point of maximum concentration, the PEC is approximately 82% of the CLo function ((PEC of Sulphur+Nitrogen deposition/CLmaxN)*100). We can therefore consider the impacts from acid deposition to be *not significant*.

<u>Impacts from nitrogen deposition</u>

The air quality assessment considers nitrogen deposition, but has potentially applied a less sensitive CLo range of 20 – 30 kgN/ha/yr for all habitats within the Teesmouth and Cleveland SPA. The assessment uses the nitrogen deposition range for the closest SSSI (Tees and Hartlepool Foreshore and Wetlands) which falls within the footprint of the SPA, rather than the more sensitive deposition range for other habitats within the SPA itself. The most sensitive habitat to nutrient nitrogen deposition in the SPA appears to be the *supralittoral sediments* which support birds like the Sandwich Tern and Little Tern. APIS states that the most sensitive CLo range for this habitat is 8 – 10 kgN/ha/yr. This more sensitive habitat could be found in the Seaton Dunes and Common SSSI within the SPA.

The Applicant's overall ecological assessment concludes that impacts can be considered to be *not significant*. They predict a PC of 1.53% (*not insignificant*) of the CLo and a subsequent PEC of 85.5%. This is based on a worst-case background deposition rate of 16.8 kgN/ha/yr (as defined on APIS). They therefore conclude that nitrogen deposition will not impact the SPA.

As stated above, the use of the CLo (20 – 30 kgN/ha/yr) might not consider the most sensitive habitat at the SPA. As part of our audit and check modelling, we have assessed the lower end of the CLo range (8 kgN/ha/yr) against their maximum process contribution (0.31 kgN/ha/yr). Using the Applicant's assessment prediction this results in a PC of 3.875% of the CLo. The impacts are therefore *not insignificant*. Using the background concentration for the point of maximum concentration, the PEC is 213.75% of the CLo. This check shows that due to the already high background concentrations, the overall impact could be considered significant. However, using their maximum PC for the Tees and Hartlepool Foreshore and Wetlands SSSI is not appropriate for locations with the most sensitive habitat in the SPA (Seaton Dunes and Common SSSI). This does not take into account the greater distance from the emission point to the more sensitive part of the SPA.

The SPA itself is comprised of numerous SSSI habitats with varied sensitivities to nutrient nitrogen deposition. To pinpoint more accurately the estimated impact on the most sensitive habitat of the SPA, we have used the impacts on the constituent SSSI units as a surrogate. We have done this using the Applicant's modelled process contributions for each of the SSSIs (based on the point of maximum impact) and the critical load (lowest in the range) for the most sensitive habitat of that SSSI (which corresponds to the habitats in the SPA). The results are set out in the table below. It should be noted that background concentrations also vary across the SPA. We have used the worst-case background concentration to cover all locations within the SPA.

Summary of nutrient deposition impacts across the SPA

SPA Teesmouth and Cleveland Coast							
SSSI (within 10km of discharge point)	**Most sensitive habitat**	**PC (kgN/ha /yr)**	**Critical load (kgN/ha /yr)**	**PC % of CL**	**Background concentration (kgN/ha/yr) for SPA**	**PEC**	**PEC % of CL**
Seal Sands	Littoral sediments	0.094	20 – 30	0.47	17.92 [SPA background. The backgrounds vary for each SSSI]	--	--
Cowpen Marsh	Hay meadows	0.150	20 – 30	0.75		--	--
Seaton Dunes & Common	Supralittoral sediments	0.063	8 – 10	0.78		--	--
Tees and Hartlepool Foreshore & Wetlands	Littoral sediments	0.307	20 – 30	1.53		18.2	91
South Gare & Coatham Sands	Supralittoral sediments	0.047	8 – 15	0.94		--	--

The summary in the table above illustrates that most of the modelled impacts at the relevant SSSIs within the SPA are *insignificant* with the exception of the PC at the Tees and Hartlepool Foreshore & Wetlands SSSI. The PEC at this location is below the minimum CLo so can be considered not significant. Our sensitivity checks confirm that the PEC will be lower than 100% of the CLo.

Our sensitivity checks of the Applicant's model shows that the PCs (apart from at Tees and Hartlepool Foreshore & Wetland) are all less than 1% of the relevant CLo when considering the constituent SSSI within the SPA. In particular, the most sensitive habitats of *Seaton Dunes & Common* and *South Gare Coatham Sands* are unlikely to be more than 1%.

In addition to the above, the Environment Agency is minded to accept the proposal for the following reasons:

- The process contributions and our check modelling are based on the Installation being in constant operation over the year. It assumes that the facility is operating at the IED emission limits for 8,700 hours per year and at the plausible abnormal emission levels for 60 hours per year. In reality, the facility will operate for 91% of the year (approximately 8,000 hours).
- There are uncertainties inherent to air quality modelling. We can therefore assume that the process contributions are likely to be less than presented by the Applicant and our checks to the model.
- The permit will include BAT limits for pollutants as set out in the Environment Agency's technical guidance, 'The incineration of Waste (EPR 5.01)'.
- Our modeling checks are based on conservative assumptions with impacts likely to be less than the worst-case predictions.

5.4.3 SSSI Assessment

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

Pollutant	**ES**	**Background**	**Process Contribution (PC)**		**PEC**	
Unit	**µg/m³**	**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
NO_x annual mean	30	19.77	0.85	2.8	20.62	68.7
NO_x 24 hour mean*	75	39.54	5.2	6.9	--	--
SO_2 annual mean	20[1]	3.88	0.21	1.1	4.09	20.5
NH_3 annual mean	3[2]	1.77	0.04	1.4	1.81	60.4
HF 24 hour mean*	5	4.70	0.026	0.52	--	--
HF weekly mean*	0.5	4.70	0.011	2.2	--	--

**Short term background is calculated by applying a factor of 2 to long term background concentrations*
[1[A critical level of 20 µg/m³ was applied. The Applicant should have applied a critical level of 10 µg/m³. This is a worst case benchmark should lichens and bryophytes be present
[2]A critical level of 3 µg/m³ was applied. APIS indicates that this is the appropriate benchmark for the most sensitive habitat

The table above clearly shows that some substances are less than 1% (annual mean) or 10% (short term mean) of the critical level and can therefore be considered insignificant (NO_x short term, and HF short term). However, the modelled PCs from the proposed project for NO_x (annual mean), ammonia (annual mean) and SO_2 (annual mean) are greater than 1% of the critical load. We have therefore considered the modelled PC and background concentrations to check the PECs. As shown in the table, all pollutants are less than 100% of the critical level.

Impacts from nitrogen deposition and acid deposition at the Tees and Hartlepool Foreshore & Wetlands SSSI are addressed above in Section 5.4.2.

We can therefore conclude that the above emissions are either *insignificant* or *not significant*. As part of our detailed audit, we do not necessarily agree with the figures presented in the report and displayed in the above table, however we do agree with the Applicant's conclusions.

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 (100%), provided that the Applicant is using BAT to control emissions.

Local Wildlife Site – Teessaurus Park			
Pollutant	**ES**	**Process Contribution (PC)**	
Unit	**µg/m³**	**µg/m³**	**% of EAL**
NO_x annual mean	30	0.96	3.2
NO_x 24 hour mean*	75	9.7	12.9
SO_2 annual mean	10[1]	0.24	1.2
NH_3 annual mean	3[2]	0.048	1.6
HF 24 hour mean*	5	0.049	1
HF weekly mean*	0.5	0.016	3.1

**Short term background is calculated by applying a factor of 2 to long term background concentrations*
[1]A critical level of 10 µg/m³ was applied. This is a worst case benchmark should lichens and bryophytes be present
[2]A critical level of 3 µg/m³ was applied. APIS indicates that this is the appropriate benchmark for the most sensitive habitat

Impacts from nitrogen deposition. Local wildlife site – Norton Bottoms					
PC (kgN/ha/yr)	**Critical load (kgN/ha/yr)**	**PC % of CL**	**Background concentration (kgN/ha/yr) for SPA**	**PEC**	**PEC % of CL**
0.35	20 – 30	3.5	--	--	--

Impacts from acid deposition. Local wildlife site – Charltons Pond						
CLo (keq/ha/yr)	**Baseline deposition rates (keq/ha/yr)**	**PC (keq/ha/yr)**	**Total PC (keq/ha/yr)**	**PC % of ES**	**PEC (keq/ha/yr)**	**PEC % of ES**
2.344 MinCLmaxS	0.42	0.0657	0.0907	3.3	2.5	92.6
2.701 MinCLmaxN	1.99	0.0250				
0.357 MinCLminN						

The tables above show that the PCs are below the critical levels or loads. We have used the impacts at the conservation site with the worst case impacts (Teessaurus Park Local Wildlife Site, Norton Bottoms Local Wildlife Site and Charlton's Pond Local Wildlife Site). We are satisfied that the Installation will not cause significant pollution at the sites. The Applicant is required to prevent, minimise and control emissions using BAT, this is considered further in Section 6.

The impact from the water quality on the SPA has been considered in section 5.6 below.

5.5 Impact of abnormal operations

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

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

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

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

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

- Dioxin emissions of 10 ng/m^3 (100 x normal)
- Mercury emissions are 100 times those of normal operation
- NO_x emissions of 550 mg/m^3 (1.375 x normal)
- Particulate emissions of 150 mg/m^3 (5 x normal)
- Metal emissions other than mercury are 15 times those of normal operation
- SO_2 emissions of 450 mg/m^3 (2.25 x normal)
- HCl emissions of 900 mg/m^3 (15 x normal)

It should be noted that the Applicant has not considered the impacts from unabated emissions from PCBs. We have performed our own checks of PCB emissions.

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

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

Pollutant	EQS/EAL	Background	Process contribution (PC)		Predicted environmental concentration (PEC)	
	µg/m³	µg/m³	µg/m³	% of EAL	µg/m³	% of EAL
NO_2	[2]200	50	44.85	22.4	94.85	47.4
PM_{10}	[3]50	39.8	9.48	19	49.28	98.6
SO_2	[4]266 [5]350 [6]125	9 9 9	112.14 104.22 66.27	42.2 29.8 53	121.14 113.22 75.27	45.5 32.3 60.2
HCl	[7]750	1.4	218.36	29.1	219.78	29.3
HF	[7]160	4.7	21.84	13.6	26.54	16.6
Hg	[10]7.5	0.04002	0.145	1.934	0.18502	2.47
Sb	[10]150		0.033	0.022	--	--
Cu	[10]200		0.084	0.042	--	--
Mn	[10]1,500		0.174	0.012	--	--
Cr (II)(III)	[10]150		0.26689	0.178	--	--
V	[1]1	0.00532	0.01741	1.741	0.02273	2.273
PCBs	[10]6		--	--	--	--
Dioxins			2.99e-6			

Notes

[1] 24 hour maximum
[2] 99.79th percentile of 1 hour means
[3] 90.41st percentile of 24 hour means
[4] 99.9th percentile of 15 minute means
[5] 99.73rd percentile of 1 hour means
[6] 99.18th percentile of 24 hour means
[7] 1 hour average
[10] 1 hour maximum

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 for; Hg, Sb, Cu, Mn, Cr and V.

Also from the table above emissions of the following emissions (which were not screened out as insignificant) have been assessed as being unlikely to give rise to significant pollution in that the predicted environmental concentration is less than 100% of short term ES. These consist of; NO_2, PM_{10}, SO_2, HCl and HF. 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/m³ for the maximum period of abnormal operation, this would result in an increase of approximately 67.8% in the TDI reported in section 5.3.3. In these circumstances the TDI would be 0.610 pg(I-TEQ/ kg-BW/day), which is 30.5% of the COT TDI. This is based on the adult agricultural receptor at the point of maximum impact breast feeding an infant. It should be noted that this point lies within an industrial area and is uninhabited. Assuming the impact of abnormal operations, it is calculated that this receptor will be exposed to (30.5% x 1.6781) = 51.2% of the UK TDI for dioxins At this level, emissions of dioxins will still not pose a risk to human health.

As stated above, the Applicant has not assessed the impact of abnormal operations on PCB emissions. However, our check modelling confirms that any increased emissions in PCBs during abnormal operations will be well below the 10% insignificance threshold.

5.6 Other Emissions

Emissions to Water

The Applicant submitted an assessment of the impact of a cooling water discharge upon the River Tees. The assessment reports are entitled:

- *TEEL Billingham EfW Project. Additional environmental support* (ref *DER5922-RT001-T01-00*)
- *TEEL Billingham EfW Project. Cooling water dispersion assessment* (ref *DER5748-RT001-R02-00*)

The water cooled condenser will abstract water at a rate of 4,680 m^3/hour from the River Tees, which it will then discharge back into the river via a separate point as a thermal discharge. The position of the discharge on the river means that the Installation will discharge into TraC waters (Transitional (estuaries) and Coastal). 100% of the total abstracted water will be returned back to the river. The environmental permit will include permission to discharge the cooling water. However, the Applicant will need a separate permission from the Environment Agency to abstract the river water. The abstraction does not form part of this assessment.

Cooling water has the potential to produce columns of elevated temperatures at the discharge point, known as the mixing zone. A mixing zone is part of a body of surface water which is restricted to the proximity of the point of discharge within which the Competent Authority is prepared to accept Environmental Quality Standard (EQS) exceedance, provided that it does not affect the compliance of the rest of the water body with the EQS. Should these temperatures be too high and cover the entire water column, thermal barriers to fish species may occur and prevent natural migration patterns. This may have consequences upon the habitats of protected European sites downstream of the discharge. Thermal barriers could prevent the migration of the fish species and therefore have an impact the feeding practices of bird species dependent on this food source at the SPA. Furthermore, the abstracted water is dosed with a biocide, sodium hypochlorite to prevent fouling within the condenser and associated pipework and infrastructure. The assessment also considers the potential impact of the biocide to receiving water. A discussion of the impacts from the biocide is provided in the final paragraph of this section (Section 5.5).

Cooling water discharge assessment criteria

The modelled impacts from the cooling water discharge have been assessed against the thresholds specified in the British Energy Estuarine & Marine Studies (BEEMS) advisory report, *Thermal standards for cooling water from new build power stations* (2011). The thresholds in the BEEMS report are split into total temperature and excess temperature at SPAs and in TraC waters. These consist of the following:

- 2°C as a maximum allowable concentration (above ambient) at the edge of the mixing zone.
- 3°C as a maximum allowable concentration (above ambient) at the edge of the mixing zone for TraC waters of ‘Moderate’ condition under the Water Framework Directive.
- 28°C as a 98%-ile at the edge of the mixing zone.
- 23°C as a 98%-ile at the edge of the mixing zone (for TraC waters).

Furthermore, in line with international good practice as outlined in the BEEMS report, it is also recommended that the mixing zone should not occupy more than 25% of the cross-sectional area of an estuarine channel as an annual 98 percentile.

These thresholds show that a mixing zone can be permitted if it can be demonstrated it will not have an adverse effect on site (SPA) integrity. These thresholds are not specified in the Habitats Directive but are derived based on the requirement in the Directive which stipulates that European protected habitats and species be maintained or restored with strict protection of species listed in Annex IV of the directive. The above standards are therefore interim standards as recommended by the UK Technical Advisory Group (2006). The Applicant's assessment must therefore determine that the predicted mixing zone temperatures do not breach the above standards for TraC waters and at the SPA.

Modelled findings - SPA

The Applicant's report considers the impact of the cooling water on the areas of the SPA which may be affected by a change in the thermal regime. The closest part of the SPA downstream of the discharge is located at NZ 51504 21107, approximately 4,015m away. This particular part of the designated site is also a SSSI, the Tees and Hartlepool Foreshore Wetlands and is considered a littoral sediment habitat. The SSSI *Views about Management* document by Natural England, states, 'intertidal mud and sand flats include a range of generally muddy or sandy low-gradient shores that are exposed to air during low tide and submerged during the higher tides'. This area supports wetland bird species:

Wetland bird assemblages	
Designated under SPA	**Designated under SSSI**
Knot, Calidris Canutus	Purple Sandpiper, Calidris Maritima
Little Tern, Sterna Albifrons	Sanderling, Calidris Alba
Redshank, Tringa Totanus	Shoveler, Anas Clypeata
Sandwich Tern, Sterna Sandcicensis	--

The Applicant's assessment considers the impact from the mixing zone on this closest point and concludes that the impact on the SPA is unlikely to have an impact on the habitats for both excess temperature and total temperature at this location. The mixing zones return to ambient well before the closest designation boundary. These are illustrated in the maps presented in Annex 5. Temperature at the closest point to the SPA downstream is predicted to be 16 – 18°C.

Assessment of the discharge also considers the outfalls from nearby downstream thermal discharges. Total mixing zone (including these additional discharges) show a maximum of a 20°C mixing zone approximately 200m from the outfall. There will be a +3°C mixing zone about 300 – 400m downstream of the outfall resulting from the merger with existing discharges. While this is 1°C greater than the maximum allowable concentration at the edge of the mixing zone (as per the BEEMS SPA threshold of 2°C), the end of the mixing zone (+2°C) is approximately 2,200m from the closest point of the SPA boundary.

Consideration must also be given to the thermal body and whether it poses a risk to migratory fish. As a number of the bird species feed on fish (Great Cormorant, Little Tern and Sandwich Tern), the development of thermal barriers in water bodies could influence the availability of their food sources. The Applicant's assessment addresses this issue. As water temperatures may influence the ability of migrating salmonids and juvenile fish, the Applicant's report states, 'a potential strategy for migrating salmonids to reduce the negative impacts of high water temperatures in freshwater is by actively seeking out cooler areas of the river (behavioural thermoregulation)'. The model assesses whether there will be adequate areas in the river cross sectional water body for the fish to continue to migrate past the elevated thermal sections.

The assessment considers the excess temperatures predicted through the water column at different scenarios; along different stages of spring and neap tides and during periods of high and low river flows. The outcomes predict that the warmest part of the thermal plume will remain close to the western bank of the river. This leaves a large section of the channel available for the upstream migration of fish which is less than the +2°C above ambient threshold for excess temperatures. The assessment concludes that approximately 11% of the cross-section was predicted to exceed +2°C of the threshold. This is below the 25% threshold as detailed in the BEEMS guidance.

Using the thresholds defined above, it can be clearly stated that the impact of cooling waters on the features of the SPA will not affect the supporting habitat based on the return to ambient conditions at the designated site location. We can therefore conclude no likely significant affect from the changing temperatures.

<u>Modelled findings – TraC waters</u>

As outlined above, in the ecological assessment, for ‘moderate’ waterbodies a +3°C threshold is stated for maximum allowable temperature uplift. For the maximum allowable temperature, BEEMS specifies 23°C. The total mixing zone (including the additional discharges) show a maximum of 20°C of the mixing zone approximately 200m from the outfall. There will be a +3°C mixing zone about 300 – 400m downstream of the outfall by merging with the existing discharges.

Limits on flow and temperature have been imposed on the Operator based on the predictions of the model.

The final aspect of the water quality assessment focuses on impact from the use of biocides on the receiving waters and eventual impact at the SPA. The biocide selected by the Applicant is sodium hypochlorite. The UK environmental quality standard (EQS) for chlorine in estuarine and coastal waters has a maximum allowable concentration (MAC) of 10 µg/l (95^{th}-%ile concentration of total residual oxidant). The model provides conservative predictions as the biocide was represented as a conservative tracer with no decay rate. The concentrations predicted by the report are below 0.2 µg/l (2% of the EQS) within the extent of the mixing zone (see Map 10). While the predicted impact is greater than the 1% screening criteria for ‘insignificant’ impacts, the MAC is significantly lower than the EQS. Furthermore, the chosen biocide is capable of a rapid degradation rate. We can therefore conclude no likely significant affect from the addition of the biocide.

6. Application of Best Available Techniques

6.1 Scope of Consideration

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

- The first issue we address is the fundamental choice of incineration technology. There are a number of alternatives, and the Applicant has explained why it has chosen one particular kind for this Installation.
- We then consider in particular control measures for the emissions which were not screened out as insignificant in the previous section on minimising the Installation's environmental impact. They are; nitrogen oxides, sulphur dioxide, VOCs (as 1, 3 butadiene), cadmium, thallium arsenic and nickel.
- 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. However BAT Conclusions and a revised BREF for Incineration have not yet been drafted or published, so the existing BREF and Chapter IV of the IED remain relevant.

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 Waste Incineration BREF elaborates the furnace selection criteria as:

- The use of a furnace (including secondary combustion chamber) dimensions that are large enough to provide for an effective combination of gas residence time and temperature such that combustion reactions may approach completion and result in low and stable CO and TOC emissions to air and low TOC in residues.
- Use of a combination of furnace design, operation and waste throughput rate that provides sufficient agitation and residence time of the waste in the furnace at sufficiently high temperatures.

- The use of furnace design that, as far as possible, physically retain the waste within the combustion chamber (e.g. grate bar spacing) to allow its complete combustion.

The BREF also provides a comparison of combustion and thermal treatment technologies and factors affecting their applicability and operational suitability used in EU and for all types of wastes. 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 NO_x as the furnace choice could have an effect on the amount of unabated NO_x 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

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Rotary Kiln	Can accept liquids and pastes solid feeds more limited than grate (owing to refractory damage) often applied to hazardous Wastes	<10 t/h	Very well proven with broad range of wastes and good burn out even of HW	Throughputs lower than grates	TOC <3 %	Higher specific cost due to reduced capacity
Fluid bed - bubbling	Only finely divided consistent wastes. Limited use for raw MSW often applied to sludges	1 to 10 t/h	Good mixing Fly ashes of good leaching quality	Careful operation required to avoid clogging bed. Higher fly ash quantities.	TOC <3 %	FGT cost may be lower. Costs of waste preparation
Fluid bed - circulating	Only finely divided consistent wastes. Limited use for raw MSW, often applied to sludges / RDF.	1 to 20 t/h most used above 10 t/h	Greater fuel flexibility than BFB Fly ashes of good leaching quality	Cyclone required to conserve bed material Higher fly ash quantities	TOC <3 %	FGT cost may be lower. Costs of preparation.
Oscillating furnace	MSW / heterogeneous wastes	1 – 10 t/h	Robust Low maintenance Long history Low NOX level Low LOI of bottom ash	-higher thermal loss than with grate furnace - LCV under 15 GJ/t	TOC 0.5 – 3 %	Similar to other technologies

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Pulsed hearth	Only higher CV waste (LCV >20 GJ/t) □mainly used for clinical wastes	<7 t/h	can deal with liquids and powders	bed agitation may be lower	Dependent on waste type	Higher specific cost due to reduced capacity
Stepped and static hearths	Only higher CV waste (LCV >20 GJ/t) Mainly used for clinical wastes	No information	Can deal with liquids and powders	Bed agitation may be lower	Dependent on waste type	Higher specific cost due to reduced capacity
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
Gasification - fixed bed	- mixed plastic wastes - other similar consistent streams - gasification less widely used/proven than incineration	1 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 operation/ maintenance costs

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Gasification - entrained flow	- mixed plastic wastes - other similar consistent streams - not suited to untreated MSW - gasification less widely used/proven than incineration	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 pre-treatment costs high
Gasification - fluid bed	- mixed plastic wastes - shredded MSW - shredder residues - sludges - metal rich wastes - other similar consistent streams - less widely used/proven than incineration	5 – 20 t/h	-temperatures e.g. for Al recovery - separation of 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
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 req. - not widely proven - need market for syngas	- dependent on process temperature - residue produced requires further processing e.g. combustion	High pre-treatment, operation and capital costs

The Applicant has carried out a review of various candidate furnace types. The review follows a qualitative assessment of the techniques and focuses on two options for more detailed consideration.

Candidate furnace types	**Considered appropriate for installation by Applicant?**	**Applicant justification**
Fixed hearth	No	Not considered suitable for large volumes of waste derived fuels.
Pulsed hearth	No	Pulsed hearths may find it difficult to meet the burnout criteria for the fuel in Chapter IV of the IED. However, it can be used for the combustion of solid fuels.
Rotary kiln	No	There is only one oscillating kiln system operating in the UK and some sites in France. While they achieve good fuel agitation, there is no comparable site which uses this technology for large amounts of waste. The capacity for a rotary kiln is approximately 8 tonnes per hour. The process capacity proposed for this Installation is 45 tonnes per hour meaning at least 6 rotary kilns would be required. This would not be a practical or energy efficient approach.
Pyrolysis or gasification	No	No proven system is available for the production of a syngas from the pyrolysis or gasification of waste derived fuels. There are no operational pyrolysis or gasification systems which are of a capacity required to process the proposed design capacity.
Fluidised bed	Yes	Designed to treat large quantities of waste derived fuels and able to use ammonia injection as a NO_x abatement to achieve emission limit values. Fluidised beds can achieve lower NO_x generation.
Moving grate furnace	Yes	A relatively simple technology and is proven to be able to process large amounts of waste derived fuels. This is an established technology in the UK and Europe.

The Applicant has proposed to use a furnace technology comprising 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's review concludes that the moving grate requires a greater consumption of ammonia. However, this is outweighed as the moving grate technology has a lower global warming potential than the fluidised bed, generate a slightly higher annual revenue, lower material costs and does not require the additional raw material of sand. A fluidised bed for this proposal would require 4,110 tonnes per annum of sand. On this basis, the grate system can be considered to represent BAT for the facility.

The Applicant proposes to use gasoil as support fuel for start-up, shut down and for the auxiliary burners. The auxiliary burners will operate when the temperature of the furnace drops to 860°C – 870°C and fire during start-up and shut down. The choice of support fuel is based on the requirements of Article 50 (3) of the Industrial Emissions Directive. The auxiliary burner should not be fed with fuels which can cause higher emissions as defined in Article 2 (2) of Council Directive 1999/32/EC. The Applicant has also identified that gas oil can be easily stored and handled in tanks. While it is flammable, it does not have the same risk as alternative fuels such as liquefied gas (LPG). Gas oil emissions will lead to sulphur dioxide emissions but will be minimised by using low sulphur gas oil.

Boiler Design

In accordance with 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:

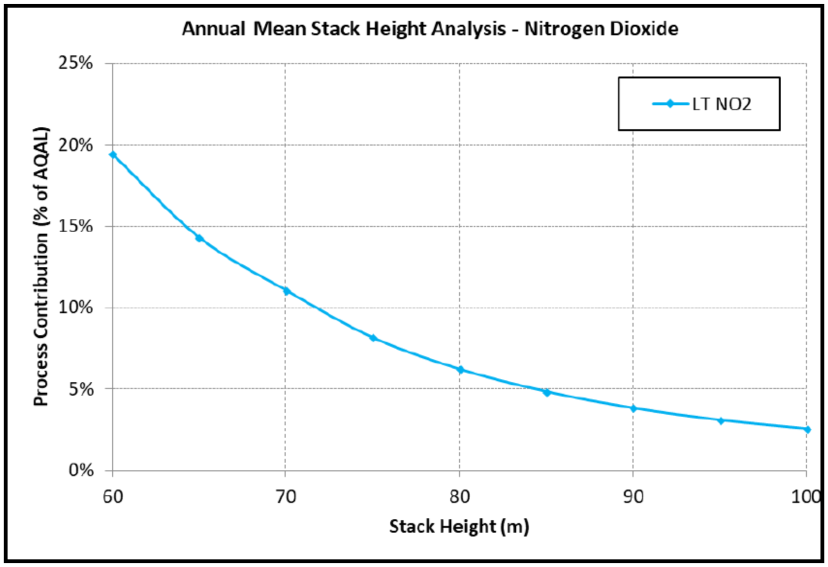
- Ensuring that the steam/metal heat transfer surface temperature is a minimum where the exhaust gases are within the de-novo synthesis range.
- Design of the boilers using CFD to ensure no pockets of stagnant or low velocity gas.
- Boiler passes are progressively decreased in volume so that the gas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

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

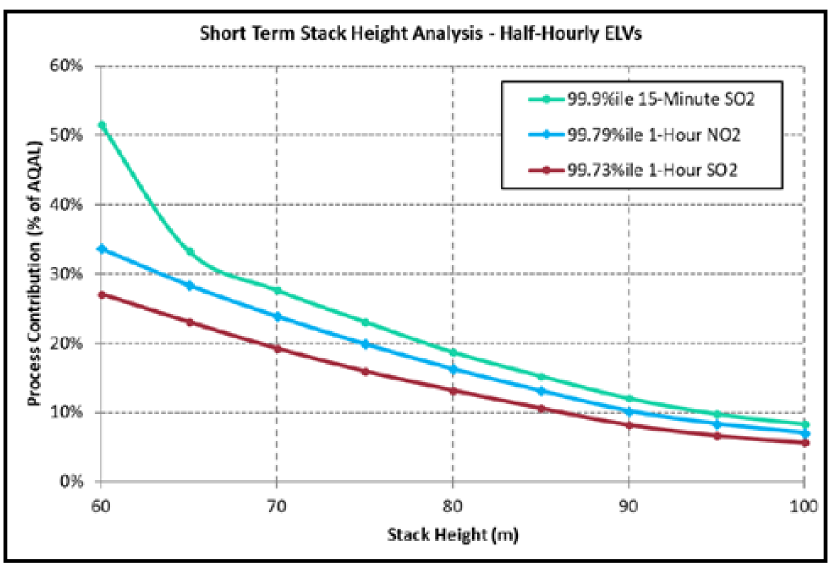
Stack height selection

The Applicant has selected a stack height of 80m. The Applicant assessed the pollution impacts against varying stack heights in their model. The model considered stack heights of 60 – 100m. It concluded the minimum recommended stack height is 75m. The assessment shows there is a slight change in the angle of the slope in annual mean concentrations at 65m and at 75m. For short term concentrations, the change is less pronounced and depends on the averaging period. Step changes occur at 65m for 15 minute mean sulphur dioxide and 75m for daily PM_{10}. The analysis shows that an 80m stack provides adequate dispersion and is greater than the expected minimum. The below tables and graphs illustrate the different process contributions against various stack heights.

Stack height (m)	**Annual Mean Process Contribution – Point of Maximum Impact (as % of AQAL)**		
	Nitrogen dioxide	**Particulate matter (as PM_{10})**	**Particulate matter (as $PM_{2.5}$)**
AQAL (µg/m³)	**40**	**40**	**25**
60	19.43%	1.39%	2.22%
65	14.31%	1.02%	1.64%
70	11.08%	0.79%	1.27%
75	8.17%	0.58%	0.93%
80	6.23%	0.45%	0.71%
85	4.86%	0.35%	0.56%
90	3.84%	0.27%	0.44%
95	3.12%	0.22%	0.36%
100	2.58%	0.18%	0.30%



Stack height (m)	Process Contribution – Point of Maximum Impact (as % of AQAL)		
	99.79%ile 1-hour NO_2	99.9%ile 15-min SO_2	99.73%ile 1-hour SO_2
AQAL (µg/m³)	200	266	350
60	34%	52%	27%
65	28%	33%	23%
70	24%	28%	19%
75	20%	23%	16%
80	16%	19%	13%
85	13%	15%	11%
90	10%	12%	8%
95	8%	10%	7%
100	7%	8%	6%



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 FGT system as a whole unit. Individual units often interact, providing a primary abatement for some pollutants and an additional effect on others.

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

- Type of waste, its composition and variation.
- Type of combustion process, and its size.
- Flue-gas flow and temperature.
- Flue-gas content, size and rate of fluctuations in composition.
- 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.
- Release of noise.

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 $5 mg/m^3$	Max temp 250°C	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	Low pressure gradient. Use with BF may reduce the energy consumption of the induced draft fan.	Not normally BAT.		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 NO_x burners	Reduces NO_x 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 NO_x control. May increase overall energy recovery	Some applications experience corrosion problems.		All plant unless impractical in design (needs to be demonstrated)

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)	NO_x emissions <70mg/ m^3 Reduces CO, VOC, dioxins	Expensive. Re-heat required – reduces plant efficiency		All plant
Selective non-catalytic reduction (SNCR)	NO_x emissions typically 150 - 180mg/m^3	Relies on an optimum temperature around 900°C, and sufficient retention time for reduction May lead to Ammonia slip	Port injection location	All plant unless lower NO_x release required for local environmental protection.
Reagent Type: Ammonia	Likely to be BAT Lower nitrous oxide formation	More difficult to handle Narrower temperature window		All plant
Reagent Type: Urea	Likely to be BAT			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 technique is considered BAT for all plant.

There are two recognised techniques for secondary measures to reduce NO_x. These are Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR). For each technique, there is a choice of urea or ammonia reagent.

SCR can reduce NO_x levels to below 70 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. SNCR can typically reduce NO_x levels to between 150 and 180 mg/m^3, it relies on an optimum temperature of around 900°C 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 considered BAT, and the use of one over the other is not normally significant in environmental terms.

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

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

Technique	**Cost of NO_x removal £/tonne**	**PC (long term) µg/m^3**	**PEC (long term) µg/m^3**
SCR	£2,180	0.74 (1.86% of ES)	30.24 (75.61% of ES)
SNCR	£4,340	2.49 (6.2% of ES)	27.49 (68.7% of ES)

Based on the figures above the Applicant considers that the additional cost of SCR over SNCR is not justified by the reduction in environmental impact. Thus SCR is not BAT in this case, and SNCR is BAT for the Installation. The Applicant has justified the use of ammonia as the reagent on the basis of:

- Handling and storage of ammonia can pose additional risk, however, once stored, there is no further handling involved. Conversely, dry urea must be made into a solution to be used as a reagent in an SNCR system.
- Ammonia gives rise to lower nitrous dioxide formation than urea, thus reducing greenhouse gases generated. Ammonia emissions (or 'slip') can occur with all reagents, but good control will limit this.
- Dry urea requires handling using large bags, whereas ammonia can be stored in silos and delivered in tankers.

The Environment Agency agrees with this assessment. The amount of ammonia used for NO_x abatement will need to be optimised to maximise NO_x reduction and minimise NH_3 slip. Improvement condition IC5 requires the Operator to report to the Environment Agency on optimising the performance of the NO_x abatement system. The Operator is also required to monitor and report on NH_3 and N_2O emissions every 6 months.

6.2.3 Acid Gases, SO_x, HCl and HF

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

Acid gases and halogens: Secondary Measures (BAT is to apply Primary Measures first)				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Wet	High reaction rates Low solid residues production Reagent delivery may be optimised by concentration and flow rate	Large effluent disposal and water consumption if not fully treated for re-cycle Effluent treatment plant required May result in wet plume Energy required for effluent treatment and plume reheat		Plants with high acid gas and metal components in exhaust gas – HWIs
Dry	Low water use Reagent consumption may be reduced by recycling in plant Lower energy use Higher reliability	Higher solid residue production Reagent consumption controlled only by input rate		All plant
Semi-dry	Medium reaction rates Reagent delivery may be varied by concentration and input rate	Higher solid waste residues		All plant

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 gasoil as the support fuel on the basis that large volumes of gas would be necessary and gas oil is easier to store and handle. The nearest high-pressure gas main is approximately 1 km from the site and the costs of making a connection would be significant. Gas oil tanks can be easily installed and used for the intermittent auxiliary firing. 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 three recognised techniques for secondary measures to reduce acid gases. These are wet, dry and semi-dry. 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.

The Applicant has therefore considered dry and semi-dry methods of secondary measures for acid gas abatement. Either 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.

In this case, the Applicant proposes to use dry lime as a reagent. Lime usage is minimised by accurately matching the acid load using fast response upstream gas monitoring. The bag filters are also designed to build up a filter cake of unreacted acid gas re-agent, this will act as a buffer during any minor interruptions in dosing. The Environment Agency is satisfied that this is BAT

6.2.4 Carbon monoxide and volatile organic compounds (VOCs)

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

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

6.2.5 Dioxins and furans (and Other POPs)

Dioxins and furans				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Optimise combustion control	All measures will increase oxidation of these species.		Covered in section on furnace selection	All plants
Avoid *de novo* synthesis			Covered in boiler design	All plant
Effective Particulate matter removal			Covered in section on particulate matter	All plant
Activated Carbon injection	Can be combined with acid gas absorber or fed separately.	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.

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.

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

6.2.6 Metals

Metals				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Effective Particulate matter removal			Covered in section on particulate matter	All plant
Activated Carbon injection for mercury recovery	Can be combined with acid gas absorber or fed separately.	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.

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 also 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

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-NO_x process.

On the credit side

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

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

The Applicant considered energy efficiency and compared SCR to SNCR 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 Applicant's assessment shows their preferred option is best in terms of GWP.

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

6.4 BAT and POPs

International action on Persistent Organic pollutants (POPs) is required under the UN's Stockholm Convention, which entered into force in 2004. The EU implemented the Convention through the POPs Regulation (850/2004), 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)
- PeCB (pentachlorobenzene)

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

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

> *Member States shall, when considering proposals to construct new facilities or significantly to modify existing facilities using processes that release chemicals listed in Annex III, without prejudice to Council Directive 1996/61/EC, 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.*

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

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

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

The release of dioxins and furans to air is required by the IED to be assessed against the I-TEQ (International Toxic Equivalence) limit of 0.1 ng/m^3. Further development of the understanding of the harm caused by dioxins has resulted in the World Health Organisation (WHO) producing updated factors to calculate the WHO-TEQ value. Certain PCBs have structures which make them behave like dioxins (dioxin-like PCBs), and these also have toxic equivalence factors defined by WHO to make them capable of being considered together with dioxins. The UK's independent health advisory committee, the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) has adopted WHO-TEQ values for both dioxins and dioxin-like PCBs in their review of Tolerable Daily Intake (TDI) criteria. The Permit requires that, in addition to the requirements of the IED, the WHO-TEQ values for both dioxins and dioxin-like PCBs should be monitored for reporting purposes, to enable evaluation of exposure to dioxins and dioxin-like PCBs to be made using the revised TDI recommended by COT. The release of dioxin-like PCBs and PAHs is expected to be low where measures have been taken to control dioxin releases. The Permit also requires monitoring of a range of PAHs and dioxin-like PCBs at the same frequency as dioxins are monitored. We have included a requirement to monitor and report against these WHO-TEQ values for dioxins and dioxin-like PCBs and the range of PAHs as listed in the Permit. We are confident that the measures taken to control the release of dioxins will also control the releases of dioxin-like PCBs and PAHs. Section 5.2.1 of this document details the assessment of emissions to air, which includes dioxins and concludes that there will be no adverse effect on human health from either normal or abnormal operation.

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

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

As described in section 5.6, the Applicant proposes to discharge abstracted cooling water directly to the River Tees. While this shows a large quantity of water as a thermal discharge, sections 5.4 and 5.6 demonstrate that impacts are insignificant. 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

Under normal operating conditions, waste water will be generated from the following processes:

- Regeneration of the resins in the demineralised water treatment plant or concentrate from the reverse osmosis system.
- Process effluent collected in the site drainage system (from boiler blow down).
- Condensate from the condensate tank.
- Effluent generated from washing and maintenance procedures.
- Water run-off collected from the bottom ash quench.

The above sources of process water will be directed to a waste water collection pit where acid dosing for pH adjustment and settlement of waste waters will take place. Effluent from the waste water pit will be discharged to sewer under a trade effluent consent. The consent is not yet in place but will be secured prior to commissioning the plant. Wash-down water consumption will be minimised by the use of trigger controls on wash hoses and the re-use of process water in the ash quench system instead of mains water.

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

6.5.3 Fugitive emissions

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

The Applicant proposes to employ the following methods and techniques to prevent and minimise the release of fugitive emissions at the proposed Installation:

- All incoming waste entering the site via the waste reception hall will be deposited into the waste bunker. The bunker is constructed of concrete and will form an impermeable surface with sealed drainage. There are no additional waste storage locations.
- External site surfacing will be bordered by kerbed containment to prevent any fugitive run off of process waters escaping the site.
- All bulk storage of liquids will be in appropriately sized tanks with associated secondary containment. Any leaks and spillages from these tanks will therefore be contained. Bunds will have a capacity greater than 110% of the largest tank or 25% of the total tankage (whichever is the greater). Potentially polluting liquids include ammonia solution reagent, fuel oil and boiler water treatment chemicals.
- Spillage kits will be available on site at locations where bulk liquids are stored.
- Uncontaminated surface water run-off from all external areas of the site (impermeable hardstanding) will be discharged directly to the River Tees via interceptors.
- Air pollution control residues (APCr) will be maintained in an enclosed system and then removed from site in sealed tankers. The enclosed system will operate as follows; APCr will be discharged from the bag filter and conveyed to an enclosed storage silo. When transferring the APCr to the enclosed tankers, a telescopic chute will be connected between the silo discharge and the filling opening of the tanker. Any air displaced from the tanker will be vented via a fabric filter unit back to the silo to prevent fugitive emissions.
- Powdered activated carbon and dry lime will be stored within silos.

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

6.5.4 Odour

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

Waste accepted at the Installation will be delivered in covered vehicles or within containers and bulk storage of waste will only occur in the Installation's waste bunker. Mixing of the waste in the bunker and periodic emptying with cleaning will prevent anaerobic conditions developing in the waste piles.

A roller shutter door will be used to close the entrance to the tipping hall outside of the waste delivery periods and combustion air will be drawn from above the waste storage bunker in order to prevent odours and airborne particulates from leaving the facility building.

During planned and unplanned shut downs, the doors of the waste chutes will be closed, waste will not be delivered to the site and the level of waste will be kept at minimal levels. In other words, the bunker will have a very low waste volume during this period. Incoming waste will be diverted to other permitted sites.

6.5.5 Noise and vibration

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

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

The assessment concluded that predicted noise levels using typical plant operating with appropriate noise mitigation would be well within sleep disturbance criteria, guidance levels within BS8233: 2014, WHO guidelines for community noise and amenity, and produce a low impact magnitude in accordance with BS4142: 2014 (i.e. rating levels less than the background sound level). We audited this assessment and we agree with the Applicant's conclusions although our sensitivity checks indicate that the worst case impacts at the identified receptors may be slightly greater than what was presented by the Applicant's assessment. However, we agree with the consultant's predictions that rating levels at all receptors will be below the background. Given the existing industrial context and with the existing measured residual and background levels being higher than the predicted operational levels, the EfW is unlikely to have any adverse impacts.

The assessment carried out by the Applicant was based on equipment that has not yet been installed, in buildings that have not yet been built. From information supplied within the Application, we consider that the proposed Installation will not cause an additional noise impact at the nearest sensitive receptors. Pre-operational condition 11 has been set in the Permit requiring the submission of a programme of monitoring at the Installation and in the surrounding environment to establish noise levels during plant commissioning and operation as specified in the Application. This will ensure that any potential impact can be identified and rectified at the earliest opportunity.

6.6 Setting ELVs and other Permit conditions

6.6.1 Translating BAT into Permit conditions

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

At the time of writing of this document, no BAT conclusions have been published for waste incineration or co-incineration.

The use of 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 Chapter IV limits in these circumstances.

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).

Local factors

We have considered the information submitted by the Applicant with respect to the nearby residential and commercial properties and local wildlife sites. This decision document outlines why we consider the impact of the proposed Installation on these features is not significant.

National and European ESs

There are no additional National and European EQS (including Article 18) that need to be considered to achieve BAT other than the limits in Chapter IV of the IED to protect the local environment.

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. 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.

Commissioning

The proposed Installation will undergo a period of commissioning before the plant becomes fully operational. The IED and the conditions set out in the permit cover activities at the Installation once it is fully operational – burning waste and providing electricity to the grid. Prior to commissioning of each regulated activity in Table S1.1 of the Permit, the Applicant shall submit a commissioning plan (required under pre-operational condition 4) to the Environment Agency for approval. It shall outline the expected emissions during different stages of commissioning, the expected duration and timeline for completion of activities and any necessary action to protect the environment in the event that actual emissions exceed expected emissions.

It is recognised that certain information provided in the Application is based upon design data or data from similarly designed operational plant. The commissioning stage provides an early opportunity to verify much of this information and the following points will be verified by the Applicant:

- A commissioning plan to be agreed with the Environment Agency (required under pre-operational condition 4).
- Development of procedures to demonstrate process control of expected emissions under different operating conditions; plant operation conforms to conditions set out in the Permit (required under improvement condition 3).
- Abatement plant optimisation (required under improvement condition 5).
- Calibration of CEMs equipment (required under improvement condition 7).
- Verification of combustion chamber residence times, temperature and oxygen content (required under improvement condition 4 and pre-operational condition 6).

6.7 Monitoring

6.7.1 Monitoring during normal operations

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

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

For emissions to water, the methods for continuous flow monitoring are in accordance with the Environment Agency's Guidance, MCERTS: *minimum requirements for the self-monitoring of flow*. With regard to monitoring total temperature discharge and the total temperature uplift, the Operator must use an appropriate thermal probe or other in-line monitoring device.

Based on the information in the Application and the requirements set in the conditions of the permit we are satisfied that the Applicant'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 Applicant 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

Chapter IV of IED specifies manual extractive sampling for heavy metals and dioxin monitoring. However, Article 48(5) of the IED enables The Commission to act through delegated, authority to set the date from which continuous measurements of the air emission limit values for heavy metals, dioxins and furans shall be carried out, as soon as appropriate measurement techniques are available within the Community. No such decision has yet been made by the Commission.

The Environment Agency has reviewed the applicability of continuous sampling and monitoring techniques to the Installation.

Recent advances in mercury monitoring techniques have allowed standards to be developed for continuous mercury monitoring, including both vapour-phase and particulate mercury. There is a standard which can apply to CEMs which measure mercury (EN 15267-3) and standards to certify CEMs for mercury, which are EN 15267-1 and EN 15267-3. Furthermore, there is an MCERTS-certified CEM which has been used in trials in the UK and which has been verified on-site using many parallel reference tests as specified using the steps outlined in EN 14181.

In the case of dioxins, equipment is available for taking a sample for an extended period (several weeks), but the sample must then be analysed in the conventional way. A CEN committee has agreed Technical Specifications (EN TS 1948-5) for continuous sampling of dioxins. This specification will lead to a CEN standard following a validation exercise which is currently underway. According to IED Article 48(5), “As soon as appropriate measurement techniques are available within the Union, the Commission shall, by means of delegated acts in accordance with Article 76 and subject to the conditions laid down in Articles 77 and 78, set the date from which continuous measurements of emissions into the air of heavy metals and dioxins and furans are to be carried out. This is yet to happen. However, our extant ‘dioxin enforcement policy’ recommends continuous sampling of dioxins where multiple emission exceedances occur and no clear root cause can be identified. Therefore should continuous sampling be required at a later date during the operation of the Installation, then sampling and analysis shall comply with the requirements of EN TS 1948.

For either continuous monitoring of mercury or continuous sampling of dioxins to be used for regulatory purposes, an emission limit value would need to be devised which is applicable to continuous monitoring. Such limits for mercury and dioxins have not been set by the European Commission. Use of a manual sample train is the only technique which fulfils the requirements of the IED. At the present time, it is considered that in view of the predicted low levels of mercury and dioxin emission it is not justifiable to require the Operator to install additionally continuous monitoring or sampling devices for these substances.

In accordance with its legal requirement to do so, the Environment Agency reviews the development of new methods and standards and their performance in industrial applications. In particular the Environment Agency considers continuous sampling systems for dioxins to have promise as a potential means of improving process control and obtaining more accurate mass emission estimates.

6.8 Reporting

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

7. Other legal requirements

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

7.1 The EPR 2016 and related Directives

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

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

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

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

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

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

In determining the Application we have considered the document:

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

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

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

7.1.2 Schedule 9 to the EPR 2016 – Waste Framework Directive

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

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

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

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

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

Article 23(1) requires the permit to specify:

(a) The types and quantities of waste that may be treated.
(b) For each type of operation permitted, the technical and any other requirements relevant to the site concerned.
(c) The safety and precautionary measures to be taken.
(d) The method to be used for each type of operation.
(e) Such monitoring and control operations as may be necessary.
(f) Such closure and after-care provisions as may be necessary.

These are all covered by permit conditions.

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

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

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

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

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

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

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

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

This Application has been consulted upon in line with this statement, as well as with our guidance RGS6 on Sites of High Public Interest, which addresses specifically extended consultation arrangements for determinations where public interest is particularly high. This satisfies the requirements of the Public Participation Directive. A summary of the responses received to our consultations and our consideration of them is set out in Annex 2.

7.2 National primary legislation

7.2.1 Environment Act 1995

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*.

Paragraph 4.2 of this Guidance provides the objectives we are to pursue when discharging our main operational functions. As far as determining applications for water discharge permits is concerned, this states that we are:

> *To protect, enhance and restore the environmental quality of inland and coastal surface water and groundwater, and in particular:*
> *to address both point source and diffuse pollution;*
> *to implement the EC Water Framework Directive; and*
> *to ensure that all relevant quality standards are met.*

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.

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.

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.

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

We have a duty to the extent we consider it desirable generally to promote the conservation and enhancement of the natural beauty and amenity of inland and coastal waters and the land associated with such waters, and the conservation of flora and fauna which are dependent on an aquatic environment. We consider that no additional or different conditions are appropriate for this Permit.

Section 6(6) (Fisheries)

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

We consider that no additional or different conditions are appropriate for this Permit. A full assessment of the impacts on the receiving water body was completed by the Applicant which considered the impact on fisheries and fish migratory routes. Full details of the assessment can be found in Section 5.6. The assessment concludes that the impact from the thermal discharge will not have an impact on migratory routes and the Applicant undertook this assessment in line with the relevant guidance.

Section 7 (Pursuit of Conservation Objectives)

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

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

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.

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.

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.

7.2.2 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.

7.2.3 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.

7.2.4 Wildlife and Countryside Act 1981

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

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

The CROW assessment is summarised in greater detail in Section 5.4.3 of this document. A copy of the full Appendix 4 Assessment can be found on the public register.

7.2.5 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.

7.3 National secondary legislation

7.3.1 Conservation of Habitats and Species Regulations 2010

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 and section 5.5 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 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 and the EQS Directive through (inter alia) environmental permits, and its obligation in regulation 17 to have regard to the river basin management plan (RBMP) approved under regulation 14 and any supplementary plans prepared under regulation 16. 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 Bathing Water Regulations 2013

We have considered our duty, under regulation 5 of these Regulations, to exercise our relevant functions to ensure compliance with the Bathing Water Directive, and in particular to take realistic and proportionate measures with a view to increasing the number of bathing waters classified as "good" or "excellent".

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

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

ANNEX 1: 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 S3.2 in Schedule 3 of the Permit.
45(1)(d)	The permit shall include the requirements for pH, temperature and flow of waste water discharges.	Conditions 3.1.1 and 3.1.2 and Table S3.2 in Schedule 3 of the Permit.
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 3.5.1 to 3.5.5 and Tables S3.1, S3.1(a) and S3.2 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, pentachlorophenol, chlorine, fluorine, sulphur, heavy metals and other polluting substances.	Not applicable.
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 of Annex VI.	Conditions 3.1.1 and 3.1.2 and Tables S3.1 and S3.1a.

IED Article	Requirement	Delivered by
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.	Conditions 3.1.1 and 3.1.2 and Tables S3.1 and S3.1a.
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.
46(6)	Limits the maximum period of operation when an ELV is exceeded to 4 hours uninterrupted duration in any one instance, and with a maximum cumulative limit of 60 hours per year. Limits on dust (150 mg/m3), CO and TOC not to be exceeded during this period.	Conditions 2.3.11 and 2.3.12.
47	In the event of breakdown, reduce or close down operations as soon as practicable. Limits on dust (150 mg/m3), CO and TOC not to be exceeded during this period.	Condition 2.3.11.
48(1)	Monitoring of emissions is carried out in accordance with Parts 6 and 7 of Annex VI.	Conditions 3.5.1 to 3.5.5. 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.	Condition 3.5.3, and tables S3.1, S3.1(a) and S3.5.
48(3)	The competent authority shall determine the location of sampling or measurement points to be used for monitoring of emissions.	Conditions 3.5.3 and 3.5.4.
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 and 3.1.2 and 3.5.5

IED Article	Requirement	Delivered by
50(1)	Slag and bottom ash to have Total Organic Carbon (TOC) < 3% or loss on ignition (LOI) < 5%.	Conditions 3.5.1 and Table S3.6
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 and Improvement condition IC4 and Table S3.5.
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 feed if the combustion temperature is not maintained.	Condition 2.3.7
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.	Condition 2.3.7
50(5)	Any heat generated from the process shall be recovered as far as practicable.	(a) The plant will generate electricity (b)Operator to review the available heat recovery options prior to commissioning (Condition PO2) and then every 2 years (Conditions 1.2.1 to 1.2.3)
50(6)	Relates to the feeding of infectious clinical waste into the furnace.	No infectious clinical waste will be burnt.
50(7)	Management of the Installation to be in the hands of a natural person who is competent to manage it.	Conditions 1.1.1 to 1.1.3 and 2.3.1 of the Permit.
51(1)	Different conditions than those laid down in Article 50(1), (2) and (3) and, as regards the temperature Article 50(4) may be authorised, provided the other requirements of this chapter are 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	Conditions 2.3.1, 2.3.4, 3.2, 3.3, 3.4, 3.6 and 3.7.

IED Article	Requirement	Delivered by
	Wastes, to prevent or minimise pollution.	
52(2)	Determine the mass of each category of wastes, if possible according to the EWC, prior to accepting the waste.	Condition 2.3.5 and Table S2.2 in Schedule 2 of the Permit.
53(1)	Residues to be minimised in their amount and harmfulness, and recycled where appropriate.	Conditions 1.4.1, 1.4.2 and 3.5.1 with Table S3.5.
53(2)	Prevent dispersal of dry residues and dust during transport and storage.	Conditions 1.4.1, 2.3.1, 2.3.2 and 3.2.1.
53(3)	Test residues for their physical and chemical characteristics and polluting potential including heavy metal content (soluble fraction).	Condition 3.5.1 and Table S3.6 and pre-operational condition PO3.
55(1)	Application, decision and permit to be publicly available.	All documents are accessible from the Environment Agency Public Register.
55(2)	An annual report on plant operation and monitoring for all plants burning more than 2 tonne/hour waste.	Condition 4.2.2 and 4.2.3.

ANNEX 2: Pre-Operational Conditions

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

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
PO1	Prior to the commencement of Commissioning, the Operator shall send a summary of the site Environment Management System (EMS) to the Environment Agency and 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). 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 which will contain a comprehensive review of the options available for utilising the heat generated, including operating as CHP or supplying district heating, by the waste incineration process in order to ensure that it is recovered as far as practicable. The review shall detail any identified proposals for improving the recovery and utilisation of heat and shall provide a timetable for their implementation.
PO3	Prior to the commencement of Commissioning, the Operator shall submit to the Environment Agency for approval 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 provide 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 Environment Agency 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 Environment Agency.
PO6	After completion of furnace design and at least three calendar months before commencement of Commissioning; the Operator shall submit a written report to the Environment Agency of the details of the CFD

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
	modelling. The report shall demonstrate whether the design combustion conditions comply with the residence time and temperature requirements as defined by Chapter IV and Annex VI of the IED.
PO7	The Operator shall submit the written protocol referenced in condition 3.2.4 for the monitoring of soil and groundwater for approval by the Environment Agency. The protocol shall demonstrate how the Operator will meet the requirements of Articles 14(1)(b), 14(1)(e) and 16(2) of the IED. The procedure shall be implemented in accordance with the written approval from the Environment Agency.
PO8	At least three months before the commencement of Commissioning, the Operator shall submit a written report to the Environment Agency specifying arrangements for continuous and periodic monitoring of emissions to air to comply with Environment Agency guidance notes M1 and M2. 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.
PO9	Prior to the commencement of Commissioning of the installation, the Operator shall ensure that a review of the design, method of construction and integrity of the proposed site secondary containment is carried out by a qualified structural engineer. The review shall compare the constructed secondary containment against the standards set out in the Environment Agency's web guidance, *Pollution Prevention for Business* https://www.gov.uk/guidance/pollution-prevention-for-businesses#storing-materials-products-and-waste and *CIRIA C736 - Containment Systems for the Prevention of Pollution - secondary, tertiary and other measures for industrial and commercial premises or other relevant industry standard*. The review shall include: • Physical condition of the secondary containment. • Any work required to ensure compliance with the standards set out in CIRIA C736 or other relevant industry standard. • A preventative maintenance and inspection regime. A written report of the review shall be submitted to the Environment Agency detailing the review's findings and recommendations. Remedial action shall be taken to ensure that the secondary containment meets the standards set out in the technical guidance documents and implement the maintenance and inspection regime. No site operations shall commence or waste accepted at the facility unless the Environment Agency has given prior written permission under this condition.
PO10	Prior to the commencement of Commissioning the installation, the Operator shall ensure that a revised fire prevention plan (FPP) is submitted to the Environment Agency for approval. The FPP must be

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
	completed in line with the Environment Agency's guidance, *Fire prevention plans: environmental permits* and the points raised in PO10 a – g. Operation of the installation must not commence until the Environment Agency has approved the FPP (and responses to PO10 a – f) in writing.
	PO10a – Reactions between waste The Operator shall include a reference to the acceptance and pre-acceptance procedures which include written procedures demonstrating how the operator will prevent incompatible wastes and hot loads from entering the waste bunker in line with sections 7.12 and 7.13 of *Fire prevention plans: environmental permits.*
	PO10b – Managing storage times The Operator shall submit the Bunker Management Procedure as referred to in the document, 'Memorandum' Ref. S2284-0210-0023JRS. The Bunker Management Procedure must demonstrate how the operator will ensure that residual waste will not remain in the base of the bunker when new waste deliveries commence. It must clearly show that the operator is capable of achieving the 'first-in first-out' principle in line with Section 8.1 of *Fire prevention plans: environmental permits.*
	PO10c - Design and construction of firewalls The Operator shall submit the design specifications and construction details of the firewalls. The firewalls must meet the requirements in Section 11.2 of *Fire prevention plans: environmental permits*; or, where appropriate justify alternative measures.
	PO10d – Design and construction of the detection and suppression systems The Operator shall submit evidence to show that the design, installation and maintenance of the in building detection and suppressions systems will be covered by an appropriate UKAS accredited third party certification scheme or a demonstrable alternative third party accreditation. The operator shall submit a written commissioning plan for the detection and suppression systems that includes, but is not limited to, the design layout, performance and operating procedure of the system.
	PO10e – Water supplies The Operator shall provide calculations, supported by evidence that the water supply available on site is capable of extinguishing a fire in the waste bunker within four hours as required by *Fire prevention plans: environmental permits*; or, where appropriate justify alternative measures.
	PO10f – Firewater containment The Operator shall submit detailed designs of the firewater containment system in line with Section 17 of *Fire prevention plans: environmental permits.* The design must show how all of the firewater generated when extinguishing a fire is contained on the site. The operator shall provide calculations to demonstrate that the capacity of the containment infrastructure is sufficient.

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
	PO10g – Contingency planning The Operator shall submit shut-down procedures to demonstrate that incoming wastes can be diverted to alternative sites. The Operator shall submit procedures showing how the site will be decontaminated, following a fire, and the steps to be taken before the site resumes normal operations. These procedures shall be submitted in line with Section 18 of *Fire prevention plans: environmental permits.*
PO11	Prior to the commencement of Commissioning of any part of the installation, the operator shall provide the Environment Agency with a written report describing the detailed programme of noise and vibration monitoring that will be carried out at the site at the commissioning stage and also when the plant is fully operational and obtain the Environment Agency's written approval to it. The report shall include confirmation of locations, time, frequency and methods of monitoring. The monitoring programme shall be carried out in accordance with the Environment Agency's written approval.
PO12	Prior to the commencement of Commissioning, the operator shall submit a written temperature monitoring plan in order to verify and validate the conclusions of the hydrodynamic and thermal dispersion modelling (*TEEL Billingham EfW Project. Additional environmental support* ref. DER5922-RT001-R01-00) of the cooling water discharge. The plan shall be submitted to the Environment Agency for approval. The plan shall: • Include details of the monitoring strategy for temperature of the thermal plume. • Time period for the monitoring strategy. Monitoring should be carried out within the first 12 months of the start of the cooling water discharge. It should take into account the changing seasonal and tidal influences of the plume. • Confirm that the exposure as assessed by the above modelling does not breach the relevant thresholds in the *British Energy Estuarine & Marine Studies. Scientific Advisory Report Series 2011 no. 008*. • Propose the measures that will be taken if monitoring does not validate the above modelling or breaches the thresholds in the above report.

ANNEX 3: Improvement Conditions

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

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
IC1	The Operator shall submit a written report to the Environment Agency on the implementation of its Environmental Management System (EMS) and the progress made in the certification of the system by an external body or if appropriate submit a schedule by which the EMS will be certified.	Within 12 months of the completion of Commissioning.
IC2	The Operator shall submit a written proposal to the Environment Agency to carry out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air from emission point A1, identifying the fractions within the PM_{10}, and $PM_{2.5}$ ranges. On receipt of written approval from the Environment Agency to the proposal and the timetable, the Operator shall carry out the tests and submit to the Environment Agency a report on the results.	Within 6 months of the completion of Commissioning.
IC3	The Operator shall submit a written report to the Environment Agency on the Commissioning of the installation. The report shall summarise the environmental performance of the plant as installed against the design parameters set out in the Application. The report shall also include a review of the performance of the facility against the conditions of this permit and details of procedures developed during Commissioning for achieving and demonstrating compliance with permit conditions and confirm that the Environmental Management System (EMS) has been updated accordingly.	Within 4 months of the completion of Commissioning.
IC4	The Operator shall carry out checks to verify the residence time, minimum temperature and oxygen content of the exhaust gases in the furnace whilst operating under the anticipated most unfavourable operating conditions. The results shall be submitted in writing to the Environment Agency and include a comparison with the computational fluid dynamic (CFD) modelling submitted with PO6.	Within 4 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	Within 4 months of the completion of Commissioning.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	operating conditions. • The lime injection system for minimisation of acid gas emissions. • The carbon injection system for minimisation of volatiles including dioxin and heavy metal emissions.	
IC6	The Operator shall carry out an assessment of the impact of emissions to air of the following component metals subject to emission limit values; Cd, As, Cr (VI) 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 EQS/EAL. In the event that the assessment shows that an EQS/EAL 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 by the results of calibration and verification testing that the performance of Continuous Emission Monitors for parameters as specified in Table S3.1 and Table S3.1(a) comply with the requirements of BS EN 14181, specifically the requirements of QAL1, QAL2 and QAL3.	Initial calibration report to be submitted to the Agency within 3 months of completion of Commissioning. Full summary evidence compliance report to be submitted within 18 months of completion of Commissioning.

ANNEX 4: Consultation Reponses

Advertising and Consultation on the Application

The Application has been published 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 published on the Environment Agency website from 9th November 2017 to 7th December 2017. The Application was made available to view at the Environment Public Register via the Environment Agency's online consultation portal.

The following statutory and non-statutory bodies were consulted:

- The Food Standards Agency
- The Local Planning Authority – Stockton-on-Tees Borough Council
- Environmental Health – Stockton-on-Tees Borough Council
- The National Grid
- Cleveland Fire and Rescue Service
- The Health and Safety Executive
- Public Health England and the Director of Public Health
- The Civil Aviation Authority
- Northumbrian Water

Consultation Responses from Statutory and Non-Statutory Bodies

Response Received from: Public Health England	
Brief summary of issues raised:	**Summary of action taken / how this has been covered**
PHE recommend that the Regulator should consider the viability of additional measures to minimise emissions to air from the Installation, particularly NO_2 and particulate matter.	We have included permit conditions to ensure that emissions are minimised. Tables S3.1 and S3.1a specify the emission limits set for the main stack in accordance with Annex VI of the IED. We have assessed the Operator's proposals for abatement techniques and agree that the use of primary abatement including low NOx burners and flue gas recirculation and secondary abatement including SNCR and fabric filters can be considered BAT to minimise emissions of oxides of nitrogen and particulates.
PHE recommend that the Operator should assess the impact of attracting vermin or pests.	We have included permit condition 3.6 to ensure that the activities do not give rise to the presence of pests likely to cause pollution. A pest management plan shall be developed and agreed with the Environment Agency should pests cause pollution, hazard or annoyance outside the boundary of the site.
Based solely on the information contained in the application provided, PHE has no significant concerns regarding risk to health	No further action required. The proposed Installation will be operated in accordance with BAT to prevent or control pollution as

of the local population from this proposed activity, providing that the Applicant takes all appropriate measures to prevent or control pollution, in accordance with the relevant sector technical guidance or industry best practice.	specified in our technical guidance notes: How to Comply EPR 5.01 – The Incineration of Waste.

The remaining statutory and non-statutory bodies consulted above did not respond for our request for comments.

<u>Consultation Responses from Members of the Public and Community Organisations</u>

The Environment Agency received consultation responses from one individual.

<u>Representations from Local MP, Councillors and Parish / Town / Community Councils</u>

Representations were not received.

<u>Representations from Community and Other Organisations</u>

Representations were not received.

<u>Representations from Individual Members of the Public</u>

A total of 1 response was received from individual members of the public. Issues raised are considered below:

<u>Air quality modelling – issues raised</u>

- 'In-combination' effects of the emissions from the Billingham Reach EfW with the nearby municipal waste incinerator, Teesside Energy from Waste Plant.

- It is unclear that the assessment addresses the potential pollution from the municipal waste incinerator rather than the previously proposed biomass incineration.

<u>Air quality modelling – Environment Agency response</u>

- The web guidance on air emission risk assessments states, *For SPAs, SACs and Ramsar sites, you need to consider the 'in combination' (combined) impact of all permissions, plans or projects that affect the site. Contact the Environment Agency for further guidance on in-combination assessments*. The Operator has considered the impact of other 'permissions, plans or projects' by performing a baseline assessment to consider the worst case background concentrations per pollutant. background concentrations are based on a variety of sources including;
    - Defra modelled background concentrations
    - UK Automatic Urban and Rural Network monitoring
    - Baseline data from Air Pollution Information System for specific European sites

- Previous layout plans showing the originally planned biomass incinerator have been superseded. Furthermore, a reassessment of the air quality assessment was submitted and audited due to an error in the additional model. The follow up model inputs are up-to-date for the technology and plant proposed for the municipal waste incinerator. The follow up reassessment of air quality was submitted to the Environment Agency on 25 June 2018.

<u>Flood Risk – issues raised</u>

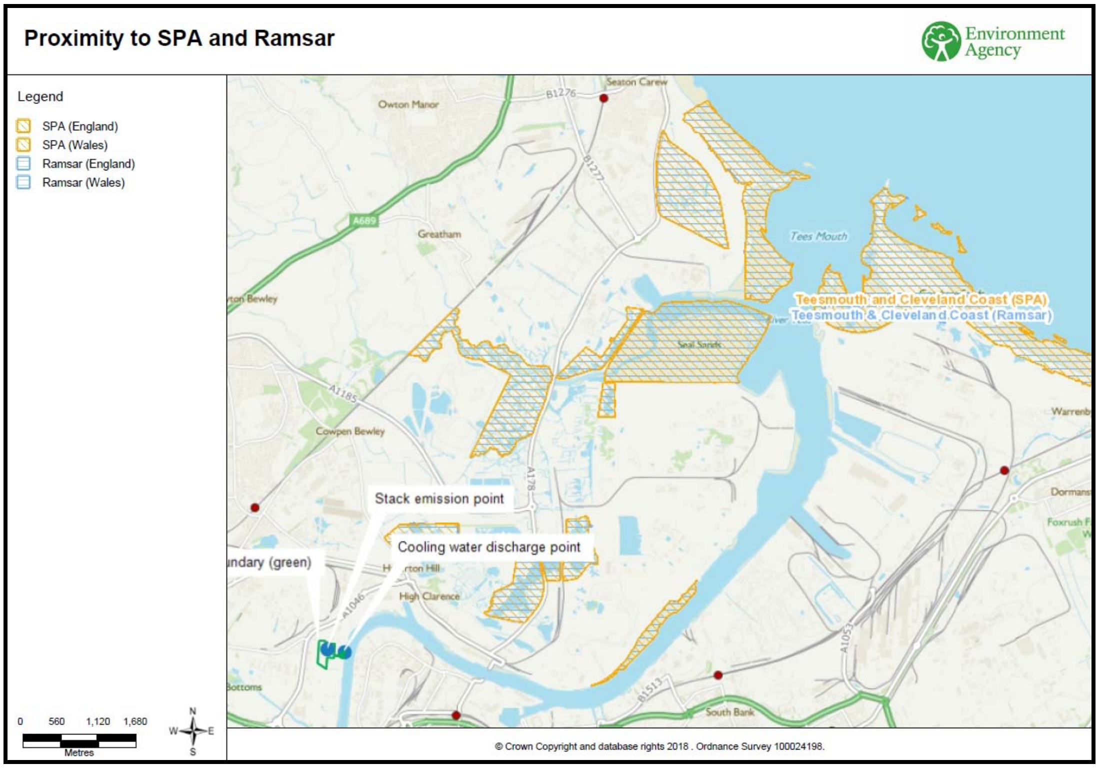
- The respondent highlighted that the site lies adjacent to the River Tees which is within a Flood Zone 3 (as defined by the Environment Agency). It may also be subject to the influence of tidal flooding and sea level rises from climate change. They highlight a section of the Applicant's Flood Risk Assessment; For the primary source of flooding, i.e. peak tidal levels, the anticipated impact of climate change for the lifetime of the site (currently estimated to be approximately 25 years due to the design life of the plant) is an increase in the 0.5% AEP [annual exceedance probability] still water flood level from 4.19m AOD to 4.44m AOD by 2055.

- The respondent points at flood risk management measures as not being sufficient in that they focus on protection of personnel and equipment rather than risks to the local and marine environment.

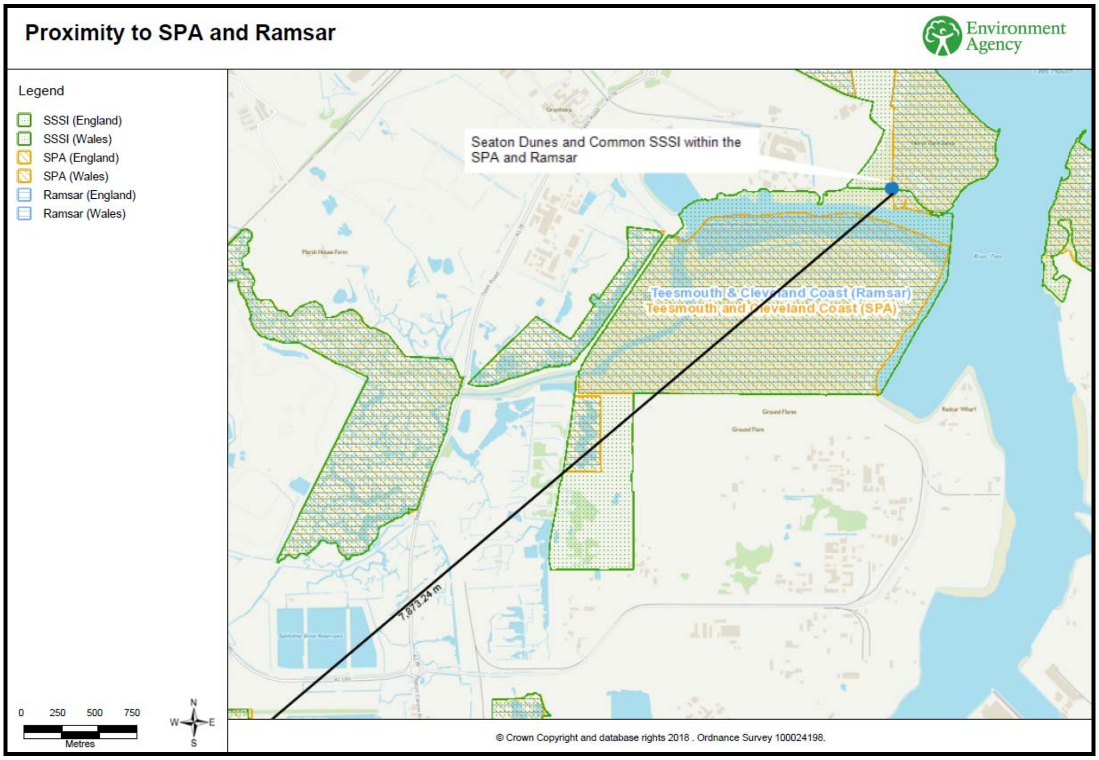
Flood risk – Environment Agency response

- The Applicant provided an addendum (received 26 March 2018) to the Flood Risk Assessment which addressed the above issues. They clarify that air fans, feedwater pumps, ash conveyors, fans, workshop, stores, electrical rooms and the continuous emissions monitoring system analysers are positioned at a height to avoid flood water damage. In order to ensure that the surrounding environment and marine environment are not impacted, the Applicant confirms that the tipping apron and the waste bunker are located at 6m AOD. Waste and leachate from the bunkers therefore can be considered as unlikely to cause pollution as a result of flooding.

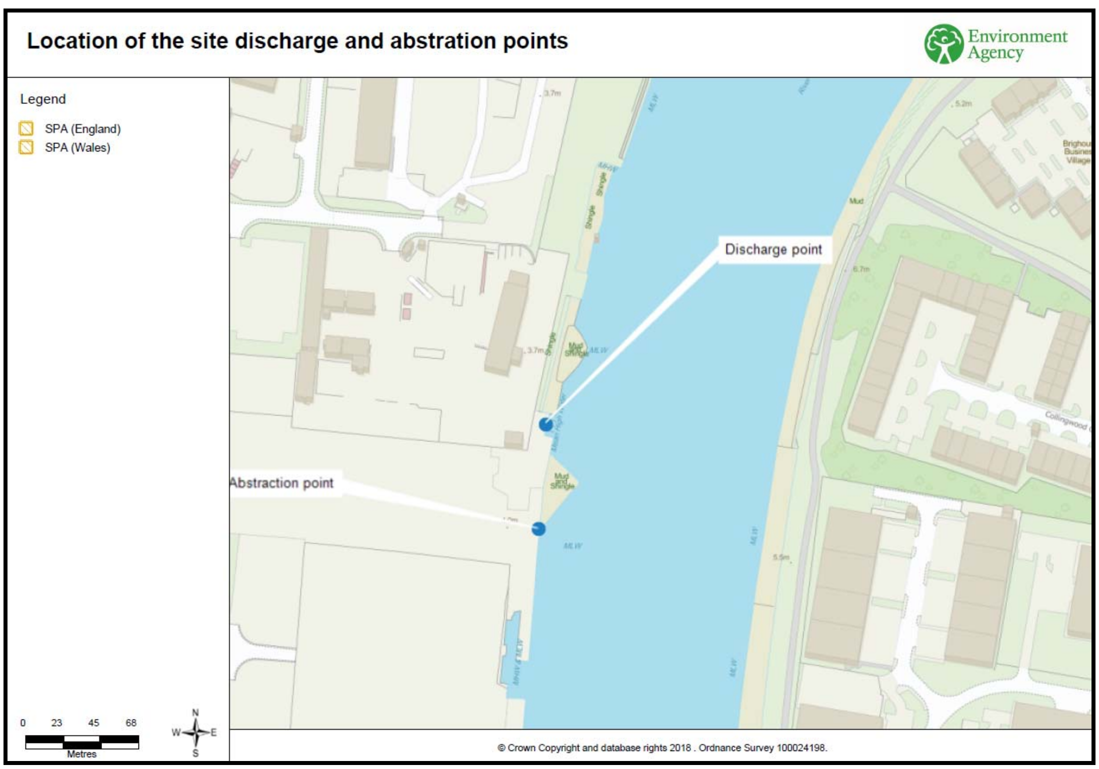
ANNEX 5: Water quality assessment maps and figures



Proximity of proposed project to the SPA



Location of Seaton Dunes and Common SSSI within the SPA



Location of discharge and abstraction points for cooling water

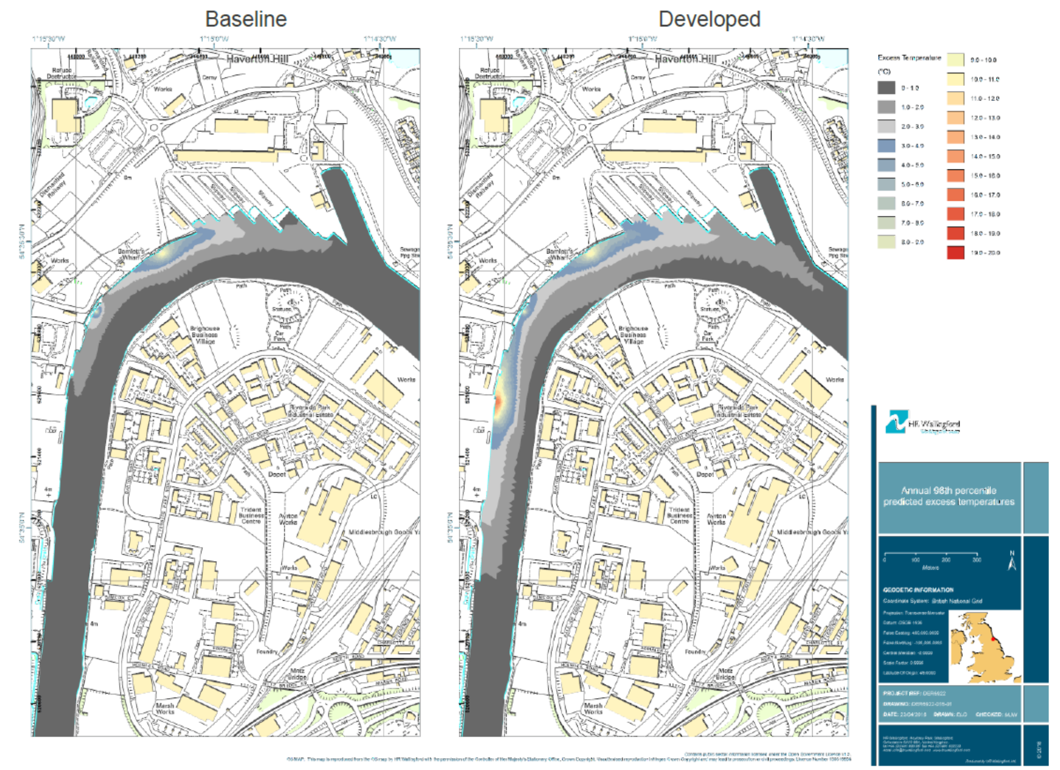
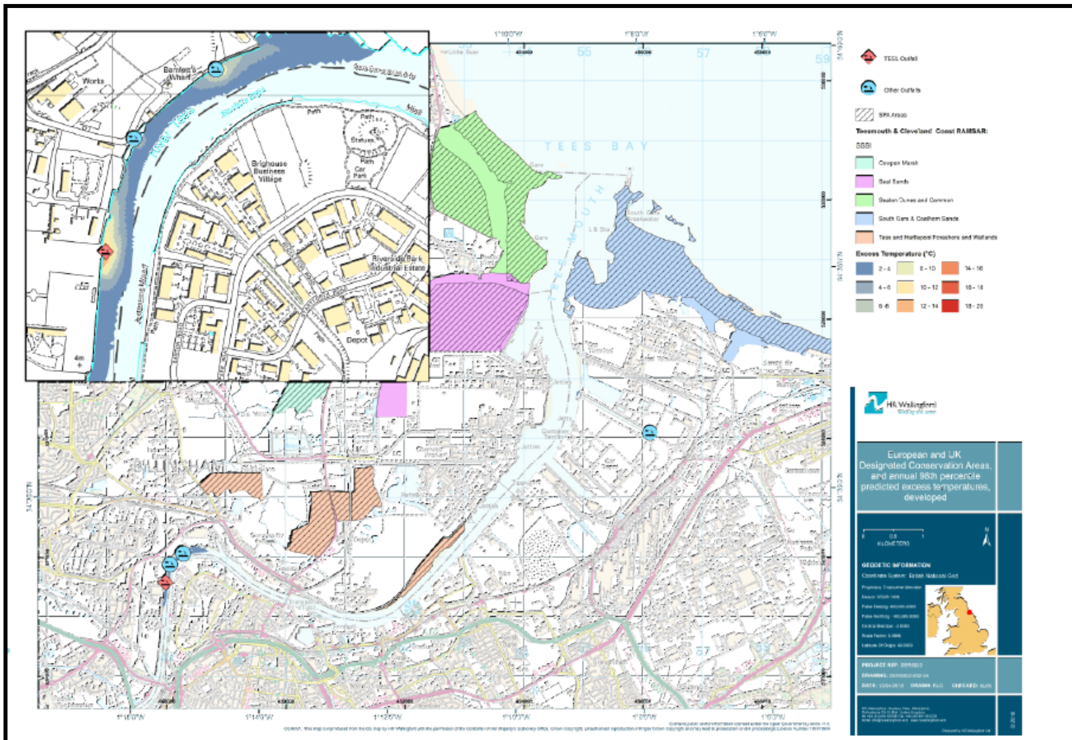
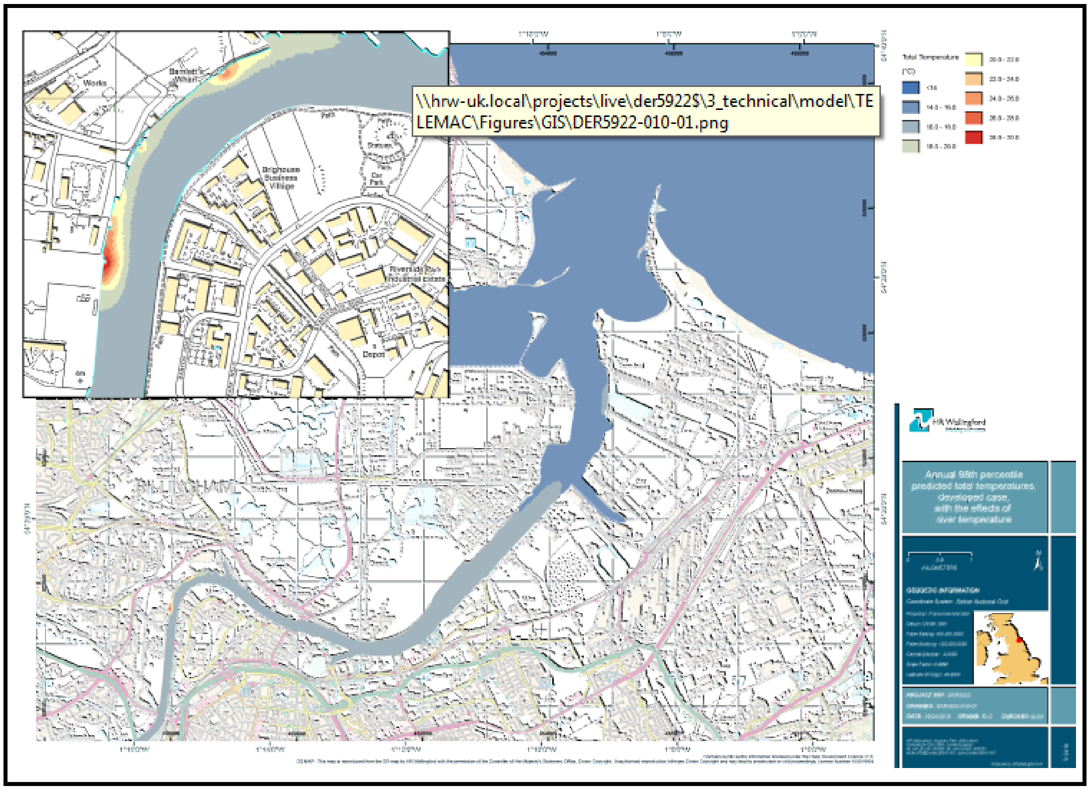


Figure 6.2: Predicted 98th-percentile excess temperatures at the water surface, baseline and developed

In combination impacts of cooling water discharge. Schematic of mixing zone showing excess temperature



In combination impacts of cooling water discharge. Mixing zone extent in relation to SPA showing excess temperatures



In combination impacts of cooling water discharge. Mixing zone extent in relation to SPA showing maximum temperatures

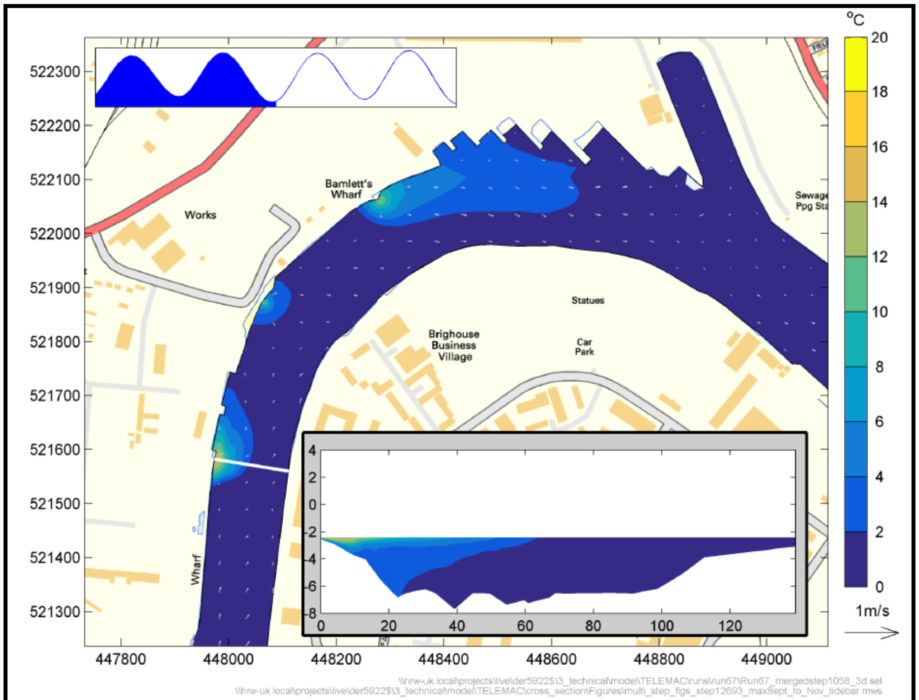


Figure C.5:Maximum coverage of the cross-section during the period Sep-Nov

Source: Background contains OS data © Crown copyright (2016)

In combination impacts of cooling water discharge. Mixing zone maximum coverage of the cross section for adult migratory fish

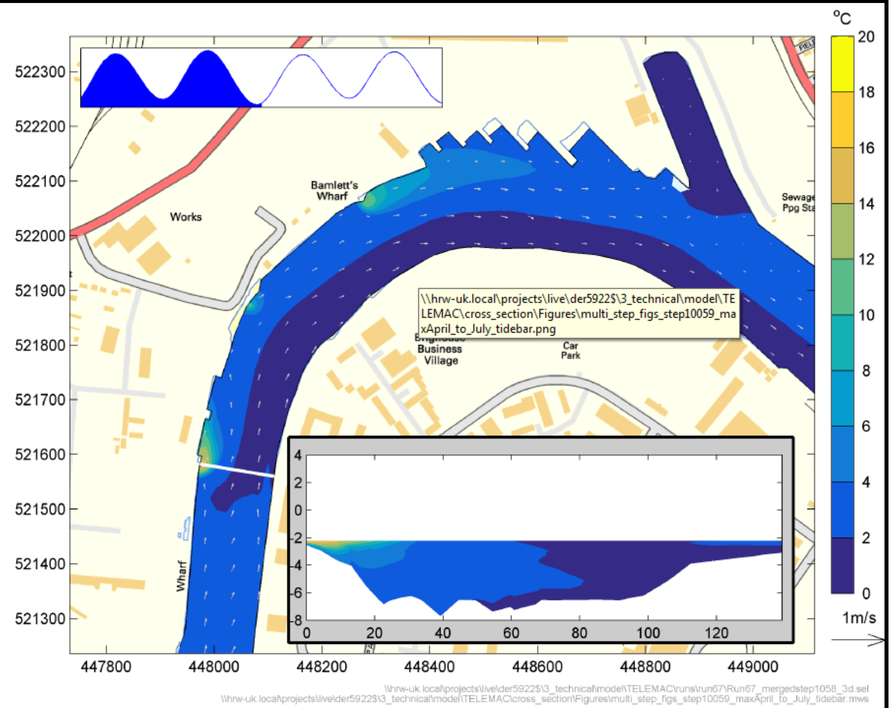
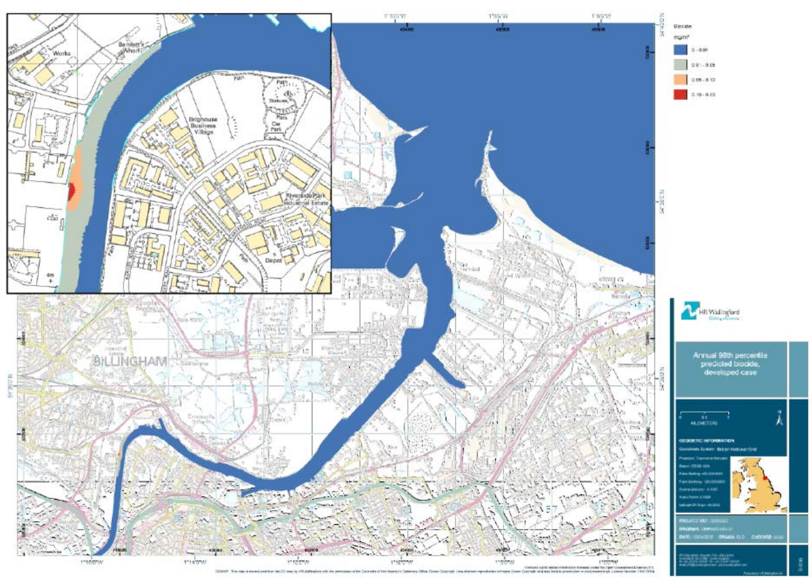


Figure C.11: Maximum coverage of the cross-section during the period April–July

Source: Background contains OS data © Crown copyright (2016)

In combination impacts of cooling water discharge. Mixing zone maximum coverage of the cross section for juvenile migratory fish

Figure 6.6: Predicted annual 98th -percentile biocide concentrations, developed case



Impacts of cooling water dischage, biocide influence. Mixing zone maximum coverage of the biocide concentrations