Determination of an Application for an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2010

Decision document recording our decision-making process

The Permit Number is:	EPR/VP3130EF
The Applicant / Operator is:	SRCL Limited
The Installation is located at:	Holesmouth Road, Avonmouth, Bristol, BS11 9BP

Preliminary information and use of terms

We gave the application the reference number EPR/VP3130EF/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/VP3130EF. We refer to the permit as “the **Permit**” in this document.

The Application was duly made on 10/03/14.

The Applicant is SRCL Limited. We refer to SRCL Limited as “the **Applicant**” in this document. Where we are talking about what would happen after the Permit is granted, we call SRCL Limited “the **Operator**”.

SRCL Limited’s proposed facility is located at Holesmouth Road, Avonmouth, Bristol, BS11 9BP. 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.)

APC	Air Pollution Control
BAT	Best Available Technique(s)
BAT-AEL	BAT Associated Emission Level
BREF	BAT Reference Note
CCW	Countryside Council for Wales
CEM	Continuous emissions monitor
CFD	Computerised fluid dynamics
CHP	Combined heat and power
COMEAP	Committee on the Medical Effects of Air Pollutants
CROW	Countryside and rights of way Act 2000
CV	Calorific value
CW	Clinical waste
CWI	Clinical waste incinerator
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DD	Decision document
EAL	Environmental assessment level
EIAD	Environmental Impact Assessment Directive (85/337/EEC)
ELV	Emission limit value
EMAS	EU Eco Management and Audit Scheme
EMS	Environmental Management System
ERV	Emergency Relief Vent
EPR	Environmental Permitting (England and Wales) Regulations 2010 (SI 2010 No. 675) as amended

EQS	Environmental quality standard
EU-EQS	European Union Environmental Quality Standard
EWC	European waste catalogue
FSA	Food Standards Agency
GWP	Global Warming Potential
HHRAP	Human Health Risk Assessment Protocol
HMIP	Her Majesty’s Inspectorate of Pollution
HPA	Health Protection Agency
HRA	Human Rights Act 1998
HW	Hazardous waste
HWI	Hazardous waste incinerator
IBA	Incinerator Bottom Ash
ID	Induced draft
IED	Industrial Emissions Directive (2010/75/EU)
IPC	Integrated Pollution Control regime
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)
LHB	Local Health Board
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
PCT	Primary Care Trust
PEC	Predicted Environmental Concentration
PHE	Public Health England
POP(s)	Persistent organic pollutant(s)
PPS	Public participation statement
PR	Public register
PXDD	Poly-halogenated di-benzo-p-dioxins
PXB	Poly-halogenated biphenyls
PXDF	Poly-halogenated di-benzo furans
RDF	Refuse derived fuel
RGS	Regulatory Guidance Series
SAC	Special Area of Conservation
SED	Solvent Emissions Directive (1999/13/EC) – now superseded by IED
SCR	Selective catalytic reduction
SGN	Sector guidance note
SHPI(s)	Site(s) of High Public Interest
SNCR	Selective non-catalytic reduction
SPA(s)	Special Protection Area(s)

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

1 Our decision

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

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

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

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

2 How we reached our decision

2.1 Receipt of Application

The Application was duly made on 10/03/14. This means we considered it was in the correct form and contained sufficient information for us to begin our determination but not that it necessarily contained all the information we would need to complete that determination: see below.

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

2.2 Consultation on the Application

We carried out consultation on the Application in accordance with the EPR.

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

1. Bristol City Council (Environmental Health Department)
2. Bristol City Council (Director of Public Health)

3. Bristol City Council (Planning Department)
4. Natural England
5. Food Standards Agency
6. Health & Safety Executive
7. Public Health England
8. National Grid

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.

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 09/06/14. This was with respect to (a) the assessment of emissions to air during abnormal operation, and (b) the assessment of emissions to air of dioxin-like polychlorinated biphenyls (PCBs). Further information / clarification on a number of points was received via email on 04/08/14, 21/11/14 and 24/11/14..

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 Waste Framework Directive (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.

Before the incinerator can be brought into operation, as well as an environmental permit, planning permission is required. Planning permission is a separate decision to be made by the relevant planning authority. In this case the relevant planning authority is Bristol City Council.

It is important to note that this document only considers those matters relevant to the grant of an environmental permit. However, the interaction between the planning and environmental permitting systems is considered in Section 7 of this document, and in response to some of the matters raised during public consultation in Annex 4.

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 activities listed in Part 1 of Schedule 1 to the EPR:

- Section 5.1 Part A (1)(a) – the incineration of hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity exceeding 10 tonnes per day.

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

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

Many activities which would normally be categorised as “directly associated activities” for EPR purposes (see below), such as air pollution control plant, (including storage and preparation of treatment chemicals), are therefore included in the above listed activity description.

The Applicant also proposes to operate a clinical waste transfer station on the site of the Installation. The permitted wastes will be limited to hazardous and non-hazardous clinical and healthcare wastes. The listed activity below relates to the storage of the hazardous waste, prior to this waste being transferred off-site for disposal or recovery.

- Section 5.6 Part A (1)(a) - the temporary storage of hazardous waste with a total capacity exceeding 50 tonnes.

An Installation may also comprise “directly associated activities”, which at this Installation includes the generation of electricity using a steam reciprocating unit. These activities comprise one installation, because the incineration plant and the steam reciprocating unit are successive steps in an integrated activity.

Other directly associated activities at the installation include the automated washing of the containers used to transport clinical waste both to and from the site.

With reference to the proposed clinical waste transfer station, the storage of the non-hazardous waste, prior to it being transferred off-site for disposal or recovery, is a ‘waste operation’ under the Waste Framework Directive.

Residual wastes from the clinical waste transfer station, whether they are hazardous or non-hazardous, will be directed to the incineration plant.

Together, the listed and directly associated activities and the waste operation comprise the Installation.

4.1.2 The Site

The proposed site is located in the industrialised area of Avonmouth, near to Bristol in the south-west of England (National Grid Reference ST 521 805). The site is surrounded by numerous other industrial and commercial premises, with the nearest being less than 50 metres away. The nearest residential premises to the site are located approximately 2.3km to the south.

The Severn Estuary, a Special Area of Conservation (SAC), a Special Area of Conservation (SPA), a Ramsar site and a Site of Special Scientific Interest (SSSI), is located 200 metres due west of the proposed facility. This is the closest site to the facility that is designated under the Habitats Regulations and the Wildlife and Countryside Act. The Avon Gorge Woodland, a SAC and a SSSI, is located approximately 5.5km south-east of the site. A surface water drainage channel called the Mere Bank Rhine flows through the site of the facility. The site is located on an aquifer but not within a groundwater source protection zone. The site is located within the floodplain, with a flood return period of 1 in 200 for tidal inundation and 1 in 100 for fluvial inundation. The site is not located within an AQMA (Air Quality Management Area), the nearest being the Bristol AQMA designated by Bristol City Council, located approximately 8km to the southeast.

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 4.2.

4.1.3 What the Installation does

The Applicant has described the facility as a healthcare waste incineration plant with associated waste transfer station. Our view is that for the purposes of IED (in particular Chapter IV) and EPR, the installation is a waste incineration plant because:

Notwithstanding the fact that energy will be recovered from the process; the process is nevertheless ‘incineration’ because it is considered that its main purpose is the thermal treatment, and hence the destruction, of waste.

The Applicant’s proposal includes the relocation of their existing incineration plant from their Nottingham site to the site in Avonmouth, Bristol. The Applicant previously operated a clinical waste incinerator at the same Avonmouth site under an IPC permit which was revoked in 2005. The site has remained in the Applicant’s ownership since then however none of the original incineration plant remains. In addition to the plant being relocated from Nottingham, there are a number of new plant items, including the abatement system, the air blast coolers, the emergency relief vent (ERV) and main stack (and associated ducting), and the steam reciprocating unit.

The proposed Installation will receive wastes that are suitable for either on-site disposal via the incineration process or transfer off-site to other appropriate disposal or recovery facilities. The waste will primarily comprise packaged healthcare waste streams, collected from various medical, veterinary and pharmaceutical sites within, but not exclusively, the catchment area of the incineration plant. This will also include some specified hazardous wastes.

The main features of the facility are as follows:

- Site access control comprising of, weigh station, and wastes reception office, for review of documentation, to ensure that the waste can be accepted at the facility. Waste will be delivered to the plant by road in United Nations (UN) approved packaging, and will be stored in locked wheeled carts.

- Intermediate storage area for “work in progress” carts. The waste will be loaded from the wheeled carts into a cradle for inspection prior to being charged into the incinerator. Any non-conforming waste can be intercepted at this point and reported in-line with the operational procedures.

- An incineration plant comprising a single incineration line of the “stepped hearth” type with a primary combustion chamber, and a secondary (gas) combustion chamber, with a total annual throughput of up to 6570 tonnes per year of waste, based on 8760 operational hours per year at a rate of 0.75 tonnes per hour.

- An incinerator bottom ash (IBA) collection system. Residues are discharged into a quench pit, where they are then conveyed into a small skip. The small skips are tipped into a larger skip and the larger skip is then removed by a lorry.

- A three-pass waste heat boiler and economiser for cooling of the hot combustion gases after they exit the secondary combustion chamber. Waste heat is recovered for use to generate electricity.

- A flue gas treatment (abatement) system where the cooled combustion gases are treated to remove contaminants, before being released to atmosphere through the main stack.

- An emergency relief vent (ERV) which allows flue gases from the secondary combustion chamber to pass directly to atmosphere via a dedicated stack in the event of specific plant malfunctions and/or breakdown.

- A steam reciprocating unit (engine) to generate electricity for use within the Installation or for export to the national grid.

- Facilities for the storage and dosing of flue gas treatment chemicals and their removal as well as for the collection and removal of incinerator bottom ash.

- A cart washing system for the re-usable waste containers. After the contents of carts have been loaded into the incinerator, the cart is the washed using a sanitizer detergent before being rinsed and drained and returned to customers. The cart washer recycles rinse water as wash water to minimise water usage. The discharge from the cart washer is dilute and contains a trace of the biodegradable detergent. This will be discharged to foul sewer via an interceptor, under a Trade Effluent consent from the local sewerage undertaker.

- A transfer station for the storage of hazardous and non-hazardous clinical and healthcare wastes pending transfer off-site for disposal or recovery, with residual wastes being passed to the incineration plant.

Raw Materials

Information relating to the nature, form and source of each waste, together with their handling requirements and hazardous properties will be required in advance as part of the pre-acceptance process. Waste will not enter the treatment process unless pre-acceptance details are in order.

Further to the completion of pre-acceptance audits, the Applicant will operate a proprietary waste tracking system, comprising bar-coded tags on the carts of waste, enabling them to be scanned and referenced against a consignment note and tracked through the disposal process from collection at the producers premises, receipt and weighing at the SRCL facility through to ultimate disposal.

Acceptance procedures will require the verification of wastes by their duty of care paperwork against waste acceptance conditions of the permit, together with a visual check. The fundamental requirement that the full contents of carts containing clinical waste can be inspected is met by the use of an inspection cradle into which the waste is tipped from the wheeled cart prior to loading into the incineration process. A waste quarantine and rejection procedure at the incinerator loading hopper will be followed, for the handling and reporting of non-conformant wastes which will be identified and quarantined pending further action.

All waste is received, handled and stored in secure areas with impermeable surfaces and sealed drainage systems. All wastes received on site will be stored by one of the following means:

- In wheeled carts that are lockable, fully enclosed and leak-proof.
- In trailers that are lockable, fully enclosed and leak-proof.
- In a designated, bunded storage area inside the building (Dental amalgam, x-ray fixer and developer, lead foils only).
- In a leak-proof skip or compactor skip (non-hazardous offensive waste only).

Wastes are fully segregated as each waste container is used for one type of waste only, ensuring that incompatible wastes having differing hazards or classifications are not mixed and cannot contaminate one another.

The maximum quantity of waste stored at the site at any given time will be 80 tonnes; 50 tonnes of storage capacity (in wheeled carts) is available within the waste processing building, and 30 tonnes of storage capacity is available outdoors (in fully enclosed leakproof trailers or skips). The outdoor storage area is reserved for waste destined for off-site transfer.

Non-waste raw materials required for the operation of the site are as follows:

- Natural gas, for start-up and shut down of the furnace and for firing of auxiliary burners
- Hydrated lime and powdered activated carbon, for use in the flue gas treatment system
- Water, for use in cooling systems, the cart washer, staff welfare facilities, and the ash quench system
- Boiler water treatment chemicals, for dosing the boiler feed water to maintain the correct water chemistry within the system
- Detergents, for the cleaning of the waste carts
- Hydraulic and silicone based oils, for the maintenance of plant.

The storage of all liquid raw materials will be bunded, with Control of Substances Hazardous to Health (COSHH) and Material Safety Data Sheets (MSDS) being retained on file for the specific products to be used. The site emergency response plan will also list the quantity and location of chemicals and oils held on the site.

Several waste blending regimes have been developed by the Applicant and are in use at their other incineration facilities. The aim of blending is to achieve a calorific value (CV) in the range of 20-23 MJ/kg in order to maintain steady combustion, minimise emissions from the process, and prevent the continued loading of high calorific value waste which can thermally overload the plant, leading to plant shutdown or cessation of waste loading until normal temperatures are restored. In order to prevent thermal overloading, and to maintain a stable throughput, three loading regimes have been established based on a trial burn of each new waste stream or waste type accepted, as follows:

Mix 1. This requires no intervention to the waste loading regime as the waste falls within the optimal CV range. The waste includes soiled surgical dressings, swabs, and other similar soiled waste, identifiable human tissue, blood, animal carcasses and tissue from veterinary centres, hospitals or laboratories and microbiological cultures and potentially infected waste from pathology departments and other clinical or research laboratories.

Mix 2. This is either a 10% high CV (typically includes sharps, medicines including cytotoxic and cytostatic medicines, pharmaceutical and chemical wastes) or low CV (typically includes used disposable bed pans or bed pan liners, incontinence pads, stoma bags and urine containers) mix. This mix is known as “one in ten” and has been developed to deal with consignments of waste that have either high or low calorific values, for example a batch of pharmaceutical waste. Bins of the high or low CV waste are loaded every tenth bin loaded into the incinerator, the other nine bins loaded being general clinical (yellow bag) waste, without any effect on the process or emissions, and it is also adopted for wastes with a high glass content; high metal content; or high moisture content.

Mix 3. This is called the high/low mix and is used when there are consignments of both high CV waste and low CV waste on site, with the procedure being to feed one high CV bin and one low CV waste bin in every 10 bins loaded, i.e. to mix one bin of each with 8 bins of general, yellow bag waste. The Applicant reports that this mix has proved very effective at maintaining throughput without having any discernible effect on the process.

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

Waste throughput, Tonnes/line	6570 tonnes/annum Single incineration line	0.75 tonnes/hour
Waste processed	Healthcare and clinical wastes	
Number of lines	One	
Furnace technology	Stepped hearth	
Auxiliary Fuel	Natural Gas	
Acid gas abatement	Dry	Hydrated lime
NOx abatement	Good air control in combustion chambers; Water sprays; Good waste loading regime. No SCR/SNCR	N/A

Reagent consumption	Lime: 300 te/annum Activated carbon: 12 te/annum	
Flue gas recirculation	No	
Dioxin abatement	Powdered activated carbon	
Main stack	Height, 40 m	Internal diameter, 0.5 m
Flue gas	Flow, 8422 Nm^3/s (at reference conditions)	Velocity, 15.44 m/s
Electricity generated	0.15 MWe	1314 MWh
Electricity exported	0.058 MWe	508 MWh
Waste heat use	No viable options for export of waste heat at the present time	

4.1.4 Key Issues in the Determination

The key issue arising during this determination was the environmental impact of emissions to air from the installation and we therefore describe how we determined this issue in most detail in this document.

4.2 The site and its protection

4.2.1 Site setting, layout and history

The proposed site is located in the industrialised area of Avonmouth, near to Bristol in the south-west of England. The site is located approximately 200 metres due east of the Severn Estuary. The site is a long and narrow, measuring approximately 150 metres by 30 metres, with a north-south orientation. It is immediately bounded by roads to the west, north and south while due east is an area of woodland and a disused railway line.

The geological bedrock under the site comprises of Mercia Mudstones, which is overlain by tidal flat deposits (clays and silts), while a layer of made ground (artificial deposit) characterises the surface of the site. In terms of hydrogeology the site is underlain by superficial deposits of unproductive strata on top of lower permeability Secondary B aquifer, which may store and yield limited amounts of groundwater.

Historical mapping information provided by the Applicant shows that prior to any development, which began in the 1920's / 30s, the site was marsh land. The construction of road and railway links and the erection of various small industrial units characterise the site for the majority of the 20^{th} century. The historical mapping does not identify any specific industrial uses during this time.

4.2.2 Proposed site design: potentially polluting substances and prevention measures

There will be no point source emissions to groundwater, surface water or land as a result of the activities at the site. All waste will be containerised in leak-proof containers and will be will be received, handled and stored in secure areas with impermeable surfaces and sealed drainage systems, with bunding. The integrity of the impermeable surfaces and bunding will be subject to regular inspection, and recorded through the preventative maintenance programme for the facility.

The possibility of any substances being discharged accidentally to land or waters will be mitigated by a number of protective measures, as follows:

- all waste is containerised in leak-proof containers
- no potentially environmentally harmful substances will be stored in significant quantities
- no hazardous substances or non hazardous pollutants (which includes the former List I and List II substances) will be stored on site
- hydraulic oils and lubricants will be stored in a bunded area
- all site surfaces will be impermeable
- all site drains are foul sewers which drain direct to the sewage works inlet.

Any spillages will be cleaned up using a spill kit and dry clean-up procedures, with any spillage residues then being incinerated.

We are satisfied that the measures described in the application are sufficient to prevent pollution of ground and groundwater.

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 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

The Applicant submitted a site condition report (SCR) which included a report on the baseline conditions as required by Article 22. Within their SCR they cited an environmental report undertaken in 1993. This report included intrusive ground investigation data which showed elevated levels of petroleum hydrocarbons across the site. This was considered to be consistent with the use of the site around this time as a trailer park / refuelling depot. This was the only sample data submitted with the application.

We reviewed the Applicant’s SCR and recommended that up-to-date information on current concentrations of contaminants in the ground/groundwater was obtained to provide a better idea of the current state of the site. We advised the Applicant that should they wish to rely on the submitted SCR as a measure of the baseline site conditions, then any contamination of the site that occurred after 1993 would become their responsibility to remediate upon surrender of the permit. Subsequent to this advice the Applicant confirmed in writing that they wished to rely on the information submitted in their original SCR as a measure of the baseline conditions.

We have therefore accepted the Applicant's SCR and consider that it adequately describes the condition of the soil and groundwater prior to the start of operations.

4.2.3 Closure and decommissioning

The Applicant did not include information in the application to enable us to determine whether the appropriate measures will be in place for the closure and decommissioning of the Installation. However, 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 account both the baseline conditions and the site's current or approved future use. To do this, the Operator has to apply to us for surrender, which we will not grant unless and until we are satisfied that these requirements have been met.

4.3 Operation of the Installation - general issues

4.3.1 Administrative issues

The Applicant is the sole Operator of the Installation.

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

The Applicant has submitted an Operational Risk Appraisal (Opra) profile under both our Installations Opra scheme for operation of the incinerator, and our Waste Opra scheme for operation of the waste transfer station. We are satisfied that the Applicant's submitted Opra profiles are accurate. The resultant Opra scores are 196 (Installations) and 64 (Waste).

The Opra scores will be used as the basis for subsistence and other charging, in accordance with our Charging Scheme. Opra is the Environment Agency's 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 as a company they operate an integrated environmental, quality and health & safety business management system which is externally certified by BSI to ISO140001, ISO9001 and OHSAS18001. They have stated that the system is a multi site certification and is operated across all their facilities, including 16 other healthcare waste facilities. They have provided an overview of their management system in the

Application. The proposed facility at Avonmouth is not included on the Applicant's existing multi-site certification. The Environment Agency recognises that certification 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 at the proposed facility.

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

4.3.3 Site security

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

4.3.4 Accident management

The Applicant has not submitted a detailed Accident Management Plan. However, having considered the 'accident management' information submitted in the Application, which identifies potential hazards, consequences and controls, 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).

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 AV/201305	Parts B2 and B3 of the Application Form. Supporting information document (reference AV/201305) including Appendices A and C. Responses to questions 5, 9, 10, 14, 15 and 23 of the Not Duly Made letter.	Together these sections describe key operating techniques and how the Installation will be operated to ensure that best available techniques are applied.
Response to Schedule 5 Notice	Abnormal emissions assessment report,	

dated 09/06/14	reference S1587-0300-0006RSF. Human Health Risk Assessment update, reference S1587-0300-0005RS.	
Additional information	Responses to questions 1, 2, 3, 5, 7 and 8 of Environment Agency e-mail dated 04/08/14.	

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.

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

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

(i) the wastes are specified within our guidance EPR 5.07 on Clinical Waste, as being ‘wastes permitted for incineration;

(ii) where wastes are not specified within EPR 5.07 as being ‘wastes permitted for incineration’, we considered the Applicant’s justification for including them on their incineration list, and concluded that they may be processed through the incineration plant;

(iii) the wastes are unlikely to contain harmful components that cannot be safely processed through the incineration plant.

The incineration capacity of the Installation is limited to 6,570 tonnes per annum. This is based on the installation operating 8,760 hours per year at a nominal capacity of 0.75 tonnes per hour, as specified by the Applicant.

The Installation will be designed, constructed and operated using best available techniques (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.

The Application also contains a list of those wastes, coded by the EWC number, which the Applicant will accept in the waste streams entering the plant and which will be stored prior to being transferred off-site for disposal or recovery. We have specified the permitted waste types, descriptions and where appropriate quantities which can be transferred off-site in Table S2.3.

We are satisfied that the Applicant can accept the wastes contained in Table S2.3 of the Permit for off-site transfer because:

(i) the wastes are specified within our guidance EPR 5.07 on Clinical Waste, as being 'wastes permitted for storage; and
(ii) the wastes are unlikely to contain harmful components that cannot be safely processed at the Installation.

4.3.7 Energy efficiency

(i) Consideration of energy efficiency

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

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

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

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

(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, principally:

- the use of a steam reciprocating unit to recover waste heat from the process;
- avoiding the unnecessary release of steam and hot water, to avoid the loss of boiler water treatment chemicals and the heat contained within the steam and water;
- equipping the induced draft (ID) fan, which is the most significant energy user, with an inverter;
- the optimisation of waste loading to maintain a steady rate of combustion using the heat generated by the process to maintain this steady state, thereby reducing the reliance upon auxiliary gas burners; and
- a comprehensive maintenance regime defined within the EMS, to ensure that plant performance is optimised with minimum energy wastage;

The Application states that the specific energy consumption, a measure of total energy consumed per unit of waste processed, will be 123 kWh/tonne. The installation capacity is 6570 t/a.

Data from the Best Available Techniques Reference Document (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.

While the above table is based on the incineration of municipal waste, rather than clinical waste, we are satisfied that the specific energy consumption of the proposed plant falls within the lowest indicative BAT range.

(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 draft CHP Ready Guidance (Dec 2012) 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 0.4 – 0.65 MWh/ tonne of waste (based on LCV of 10.4 MJ/kg). 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 has the potential to also provide heat in the form of steam for other processes and customers.

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. There is provision within the design of the facility to extract low-grade steam for supply to external customers, as this is a situation which the applicant is keen to exploit. However the location of the Installation largely determines the extent to which waste heat can be utilised, and this is a matter for the planning authority. The Applicant carried out a feasibility study at the time of application, however no suitable potential outlets for waste heat were identified. The Applicant has stated that they intend to keep this situation under review. Our permit requires the operator to review the practicability of Combined Heat and Power (CHP) implementation at least every 2 years and report their findings to the Environment Agency.

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 6(6) are met.

(iv) R1 Calculation

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

(v) Choice of Steam Turbine

In order to generate electricity the Applicant proposes to install a steam reciprocating unit rather than a steam turbine. While indicative BAT from our technical guidance points towards the use of higher efficiency electrical generation technology, e.g. a turbine, the proposed steam reciprocating unit has been selected because clinical / healthcare incinerators produce saturated steam rather than superheated steam. Saturated steam is not conducive to the effective operation of a turbine and therefore we are satisfied that the steam reciprocating unit represents BAT for the Installation.

(vii) Permit conditions concerning energy efficiency

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

The Operator is required to report energy usage and energy generated under condition 4.2 and Schedule 4. Together with the total waste burned per year, this will enable the Environment Agency to monitor energy recovery efficiency at the Installation and take action if at any stage the energy recovery efficiency is less than proposed.

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

4.3.8 Efficient use of raw materials

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

The Operator is required to report with respect to raw material usage under condition 4.2. and Schedule 4, including consumption of lime and activated carbon 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. These are the most significant raw materials that will be used at the Installation, other than the waste feed itself (addressed elsewhere). The efficiency of the use of auxiliary fuel will be tracked separately as part of the energy reporting requirement under condition 4.2.1. 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 incinerator bottom ash, and air pollution control residues.

The Applicant states that a system will be maintained to record the quantity, nature, origin, destination, and frequency of collection, mode of transport and treatment method of any waste that is disposed of or recovered, in accordance with the relevant regulations.

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 [and biological reactivity. Condition 3.1.3 and associated Table S3.4 specify limits for total organic carbon (TOC) of <3% in bottom ash. Compliance with this limit will demonstrate that good combustion control and waste burnout is being achieved in the furnaces and waste generation is being avoided where practicable.

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

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. Due to its highly alkaline state, it may be used, where economically viable, for use as a neutralising agent to treat acidic wastes. The amount of APC residues is minimised through optimising the performance of the air emissions abatement plant. The applicant states that the annual quantity of APC residues sent off-site is approximately 400-500 tonnes, but this depends on the hours of operation and on the ash content of the waste.

The operator has submitted a report on the sampling, analysis and hazard classification of clinical waste IBA. They proposed a revised sampling methodology and a hazardous status assessment methodology, which they hope to adopt at their UK incinerators. We have reviewed the report and consider that we cannot accept the proposals for implementation at the Avonmouth site at the current time. Feedback / recommendations of the report has been provided to the Applicant. In order to ensure that the IBA is adequately characterised, pre-operational condition PO2 requires the Applicant to provide a written plan for approval detailing the ash sampling protocols to be implemented. Table S3.4 requires the Operator to carry out an ongoing programme of monitoring.

The Application states that bottom ash is currently sent to landfill for disposal. The annual quantity of bottom ash currently disposed of in this way is approximately 500-600 tonnes, but this will depend on the hours of operation and the ash content of the waste. The Applicant proposes to review the market on a periodic basis to see if there are opportunities to send this material for recycling.

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 such as abstraction etc. 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.

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 H1 Guidance

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 Horizontal Guidance Note H1 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 your emissions

The H1 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 guidance 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 Quality Standards (EQS) referred to as "benchmarks" in the H1 Guidance.

Where an EU EQS exists, the relevant standard is the EU EQS. Where an EU EQS does not exist, our guidance sets out a National EQS (also referred to as Environmental Assessment Level - EAL) which has been derived to provide a similar level of protection to Human Health and the Environment as the EU EQS levels. In a very small number of cases, e.g. for emissions of Lead, the National EQS is more stringent that the EU EQS. In such cases, we use the National EQS standard for our assessment.

National EQSs do not have the same legal status as EU EQSs, and there is no explicit requirement to impose stricter conditions than BAT in order to comply with a national EQS. However, national EQSs 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 EQS; and
- the **short-term** process contribution is less than **10%** of the relevant EQS.

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

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

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

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions;
- the proposed 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 EQS 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 exceedence of an EU EQS 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. 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 on air quality is set out in the Application documents entitled 'SRCL Plant Relocation Project Air Quality Assessment', report reference S1587-0300-0002RSS, and 'SRCL Plant Relocation Project Air Quality Assessment Addendum', report reference S1587-0300-0004RSS. The assessment comprises:

- An H1 screening assessment of emissions to air from the operation of the incinerator.

- Dispersion modelling of emissions to air from the operation of the incinerator.
- A study of the impact of emissions on nearby sensitive habitat / conservation sites.

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the incinerator chimney and its impact on local air quality. The impact on conservation sites is considered in section 5.4.

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 ADMS 5.0, which is a commonly used computer model for regulatory dispersion modelling. Modelling was undertaken over a 2.94 km x 2.94 km grid centred on the Installation, with a spatial resolution of 30m. The model used 5 years of meteorological data collected from Bristol Filton weather station between 2008 and 2012. The location of the meteorological site is 7 km east of the proposed plant and therefore we would expect the data to be reasonably representative on a regional scale.

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) 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 emission limit values, i.e. the maximum permitted emission rate.
- Third, the model also considered emissions of pollutants not covered by Annex VI of IED, specifically benzo(a)pyrene and PCBs. Emission rates used in the modelling have been drawn from the Environment Agency public register information on emissions, i.e. Pollution Inventory data, (for benzo(a)pyrene), and from data in the Waste Incineration BREF (for PCBs.)

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

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

Receptor reference	Receptor name / type	Distance and direction from the main stack
R1	Jutland Road residential property	2.3km south
R2	Saltmarsh Drive residential property	3.0km southeast
R3	St Bedes Catholic College	3.2km southeast
R4	School off Long Cross	3.0km southeast

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

Pollutant (non-metals)	EQS / EAL		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	$\mu g/m^3$	Standard (see below)	$\mu g/m^3$	$\mu g/m^3$	% of EAL	$\mu g/m^3$	% of EAL
NO_2	40	1	31.1	0.4	1.00	31.5	78.8
	200	2	62.2	2.91	1.5	65.11	32.6
PM_{10}	40	1	15.67	0.03	0.08	15.7	39.3

Pollutant (non-metals)	EQS / EAL		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m³	Standard (see below)	µg/m³	µg/m³	% of EAL	µg/m³	% of EAL
	50	3	31.34	0.08	0.16	31.42	62.8
$PM_{2.5}$	25	1	10.75	0.03	0.12	10.78	43.1
SO_2	266	4	13.1	2.76	1.0	15.86	6.0
	350	5	13.1	1.76	0.50	14.86	4.2
	125	6	13.1	0.62	0.5	13.72	11.0
HCl	750	7	1.06	0.72	0.096	1.8	0.24
HF	16	8	2.35	0.00	0.00	2.350	14.69
	160	7	4.7	0.07	0.04375	4.77	3.0
CO	10000	9	620	3.7	0.04	624	6.2
VOC	2.25	1	0.21	0.03	1.33	0.240	10.67
PAH	0.00025	1	4.8E-07	5.6E-07	0.22	0.000001	0.4
PCBs	0.2	1	7.7E-05	1.39E-05	0.01	0.00009	0.05
	6	10	1.5E-04	1.39E-05	0.0002	0.00017	0.0028

VOC as 1,3 butadiene

PAH as benzo[a]pyrene

1 Annual Mean

2 99.79^{th} %ile of 1-hour means

3 90.41^{st} %ile of 24-hour means

4 99.9^{th} ile of 15-min means

5 99.73^{rd} %ile of 1-hour means

6 99.18^{th} %ile of 24-hour means

7 1-hour average

8 Monthly average

9 Maximum daily running 8-hour mean

10 1-hour maximum

Pollutant (metals)	EQS / EAL	Back-ground	Process Contribution (PC)	Predicted Environmental Concentration (PEC)

	$\mu g/m^3$	Standard (see below)	$\mu g/m^3$	$\mu g/m^3$	% of EAL	$\mu g/m^3$	% of EAL
Cd	0.005	1	0.00035	0.00007	1.4	0.00042	8.4
Hg	0.25	1	0.00216	0.00014	0.06	0.00230	0.92
	7.5	2	0.00432	0.00359	0.05	0.00791	0.105
Sb	5	1	-	0.00139	0.03	0.00704	0.14
	150	2	-	0.03595	0.02	0.01964	0.013
Pb	0.25	1	0.01098	0.00139	0.56	0.01237	4.95
Cu	10	1	0.00548	0.00139	0.01	0.00687	0.069
	200	2	0.01096	0.03595	0.02	0.04691	0.023
Mn	0.15	1	0.00623	0.00139	0.93	0.00762	5.08
	1500	2	0.01246	0.03595	0.00	0.04841	0.0032
V	5	1	0.00192	0.00139	0.03	0.00331	0.07
	1	3	0.00384	0.03595	3.60	0.03979	3.98
As	0.003	1	0.00069	0.00139	46.33	0.00208	69.3
Cr (II)(III)	5	1	0.00146	0.00139	0.03	0.00285	0.057
	150	2	0.00292	0.03595	0.02	0.03887	0.0259
Cr (VI)	0.0002	1	0.00029	0.00139	695.00	0.00168	841.0
Ni	0.02	1	0.0011	0.00139	6.95	0.00249	12.5

1 Annual Mean
2 1-hr Maximum
3 24-hr Maximum

(i) Screening out emissions which are insignificant

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

- Nitrogen dioxide, PM_{10}, $PM_{2.5}$, Hydrogen chloride, Hydrogen fluoride, Carbon monoxide, PAH (as benzo(a)pyrene), PCBs, Mercury, Lead, Copper, Manganese, Vanadium and Chromium

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

(ii) Emissions unlikely to give rise to significant pollution

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

- VOC, Cadmium, Arsenic and Nickel

For these emissions we have considered the headroom between their PEC's and the respective EQS/EAL standards relative to the predicted process contribution value for the emission. From this analysis we consider that there will not be any exceedance of an EQS/EAL or any significant pollution caused by the operation of the Installation.

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

(iii) Emissions requiring further assessment

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

- Chromium VI

Further consideration is given to the emission of Chromium VI in section 5.2.3.

5.2.2 Consideration of key pollutants

(i) Nitrogen dioxide (NO_2)

The impact on air quality from NO_2 emissions has been assessed against the EU EQS 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 short term PC is less than 10% of the EU EQS and so can be screened out as insignificant.

While the peak long term PC is equal to 1% of the EU EQS we also consider it reasonable to screen out the emission as insignificant.

Therefore, generally, we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

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

The impact on air quality from particulate emissions has been assessed against the EQS for PM_{10} (particles of 10 microns and smaller) and $PM_{2.5}$ (particles of 2.5 microns and smaller). For PM_{10}, the EUEQS 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 EUEQS 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 EQSs 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 EQS and below 10% of the short term EQS and so can be considered insignificant. Therefore, generally, 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 Environmental Quality Objective. Therefore the Environment Agency concludes that particulate emissions from the installation, including emissions of PM_{10} or $PM_{2.5}$, will not give rise to significant pollution.

There is currently no emission limit prescribed nor any continuous emissions monitor for particulate matter specifically in the PM_{10} or $PM_{2.5}$ fraction. Whilst the Environment Agency is confident that current monitoring techniques will capture the fine particle fraction ($PM_{2.5}$) for inclusion in the measurement of total particulate matter, an improvement condition (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.

(iii) Acid gases, SO_2, HCl and HF

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

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 EAL is considered in section 5.4.

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

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

The above tables show that for CO emissions, the peak short term PC is less than 10% of the EAL/EQS and so can be screened out as insignificant.

The tables also show that emissions of PAHs and PCBs can be screened out as insignificant. For PAHs, the peak PC is < 1% of the long term EQS/EAL. The Applicant has used the EQS for benzo[a]pyrene (BaP) for their assessment of the impact of PAHs and we agree that the use of the BaP EQS is sufficiently precautionary. For PCBs, the peak PC is < 1% of the long term EQS/EAL and <10% of the short term EAQ/EAL.

Therefore, generally, we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

For VOC emissions, the peak long term PC is greater than 1% of the EQS/EAL and therefore cannot be screened out as insignificant. Even so, from the table above, the emission is not expected to result in the EU EQS being exceeded.

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

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

There is no EAL for dioxins, furans and dioxin like PCBs 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

In summary for the above emissions to air, 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. Therefore, generally, we consider the Applicant's proposals for preventing and minimising the emissions of CO, VOC's, PAHs and PCBs to be BAT for the Installation. Dioxins, furans and dioxin like PCB's 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.

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 metal).
- 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 emission limits for metals along with the Application of BAT also ensures that these requirements are met.

The Applicant has followed the Environment Agency guidance on impact assessment for group 3 metals, in "Releases from municipal waste incinerators" (Sept 12, v3), which sets out a 3 stage assessment procedure.

Where IED sets an aggregate limit, the Applicant's first stage of 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 result in a breach of the limit, and so represents a very much worst case scenario. However using this very conservative assessment approach it can be seen from the tables above that the impact from metals mercury, lead, copper, manganese, vanadium and chromium can be considered as insignificant, and the impact from metals cadmium, arsenic and nickel considered unlikely to cause an exceedance of an EQS/EAL.

There is no EQS/EAL for thallium. Where IED sets an aggregate limit for emissions of cadmium and thallium, the Applicant's assessment assumes that the entire emission consists only of cadmium, emitted at the relevant aggregate emission limit value. The Applicant reports that monitoring from waste facilities indicates that concentrations of cadmium are usually only about 8% of the IED limit and so they consider their assessment to be highly conservative. Given that the process contribution of thallium is similar to that of the other metals, we consider the emissions of thallium to be not significant.

Likewise for cobalt which does not have an assigned EQS/EAL value, we consider the emissions of this metal to be not significant, as the process contribution of cobalt is similar to that of the other metals.

In summary, from the data presented in the tables at section 5.2.1 above and the impact assessment criteria described subsequently, we are satisfied that the emissions of the following metals can be screened out as being insignificant:

- Mercury, Lead, Copper, Manganese, Vanadium and Chromium

and that the following metal emissions whilst not able to be screened out as insignificant, are assessed as being unlikely to give rise to significant pollution due to exceedance of an EQS/EAL:

- Cadmium*,* Arsenic and Nickel

Chromium VI was the only metal requiring further assessment as it could not be screened out during the first stage of assessment. This means that for emissions of this metal, the assessment predicts that an exceedence of the relevant EQS/EAL could potentially occur.

For all other metals, the Applicant has concluded that exceedences of the EQS/EAL are not likely to occur. The Environment Agency's experience of regulating incineration plant is that emissions of metals are in any event below the limits set in IED. We therefore agree with the Applicant's conclusions.

Where IED sets an aggregate limit, the Applicant's second stage of assessment assumes that chromium is emitted as the proportion of metals in its group (i.e. one ninth of the limit for each of the group 3 metals). The Applicant has also assumed that the entire chromium emission is in the hexavalent form, i.e. Chromium VI, which is again a highly conservative assumption.

There is little data available on the background levels of Chromium VI; so the Applicant has assumed this to be 20% of the total chromium background level, 20% is the typical value of Chromium VI in total chromium reported in the environment in the EPAQS Guidelines. We are satisfied with this assumption.

The Applicant's results showed that Chromium VI could not be screened out at the second assessment stage, because the PC was greater than 1% of the long term EQS/EAL and the PEC was greater than 100% of the long term EQS/EAL.

The Applicant's third stage of assessment for Chromium VI considered site specific assumptions.

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 EALs in the revised H1 Guidance issued by the Agency in 2010.

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 (MWI's) 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 $1.3 * 10^{-4}$).

The Applicant provided summary data from extractive sampling for Group 3 metals in flue gases from six Clinical Waste incinerators (CWI's) which they operate in the UK. The data showed that emissions of metals to air from both MWI's and CWI's are broadly similar. The data for chromium is shown below.

Pollutant	Measured Concentration as % of IED Group 3 ELV – Environment Agency Guidance			Measured Concentration as % of IED Group 3 ELV – CWI Monitoring		
	Mean	Max	Min	Mean	Max	Min
Chromium	2.18%	10.42%	0.08%	3.06%	7.76%	0.78%

The Applicant does not monitor for Chromium VI in the APC residues at any of their CWI's. They have argued however that due to the similarity in the monitoring data from both types of incinerator, and since the combustion mechanism is similar in CWI's and MWI's, they anticipate the fraction of Chromium VI in the flue gases from CWI's to be similar to the fraction present in the flue gases from MWI's.

The Applicant has therefore used the maximum emission concentration for Chromium VI from the MWI monitoring data, i.e. $1.3 * 10^{-4}$ mg/m^3, in their third stage of assessment. We are satisfied that this emission concentration remains appropriate for clinical waste incineration and that it is a conservative assumption for the assessment.

The Applicant has used the above data to model the predicted Chromium VI impact. The PC is predicted as 0.18% of the EQS/EAL. Their assessment shows that emissions of Chromium VI are likely to be insignificant.

We have undertaken check modelling to assess the validity of the Applicant's predictions. We agree with the Applicant's conclusions.

5.2.4 Consideration of Local Factors

(i) 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:

i) Applying Statutory Controls

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

The main conditions in an EfW permit are based on the requirements of the IED. Specific conditions have been introduced to specifically ensure compliance with the requirements of Chapter IV. The aim of the IED is to prevent or, where that is not practicable, to reduce emissions to air, water and land and prevent the generation of waste, in order to achieve a high level of protection of the environment taken as a whole. IED achieves this aim by setting operational conditions, technical requirements and emission limit values to meet the requirements set out in Articles 11 and 18 of the IED. These requirements 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.

ii) Environmental Impact Assessment

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

iii) Expert Scientific Opinion

We take account of the views of national and international expert bodies. Following is a summary of some of the publications which we have considered (in no particular order).

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

HPA (now PHE) in 2009 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”. Revision to statement in 2011......

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.

iv) Health Risk Models

Comparing the results of air dispersion modelling as part of the H1 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 PCB's, 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 PCB's 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 HHRAP and the HMIP 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 HMIP model uses a similar approach to the HHRAP model, but does not attempt to predict probabilistic risk. Either model can however be used to make comparisons with the TDI.

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 and furans, the HHRAP model enables a risk assessment from human intake of a range of heavy metals. The HMIP report does not consider metals and PCB's. In principle, the respective EQS for these metals are protective of human health. It is not therefore necessary to model the human body intake.

In their assessment the Applicant did make predictions for body intake of a range of heavy metals using the HHRAP method, but for the reason given above we have not considered these predictions for the purpose of our determination.

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 an H1 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 H1 assessment methodology comparison for most pollutants (including metals) and dioxin intake model using the HHRAP model as described above for dioxins, furans and dioxin like PCB's. Where an alternative approach is adopted for dioxins, we check the predictions ourselves.

v) Consultations

As part of our normal procedures for the determination of a permit application for this type of application, we would consult Public Health England (PHE) and the Food Standards Agency (FSA). 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 PCB's

For dioxins, furans and dioxin like PCB's, 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, furans and dioxin like PCB's that would be received by local receptors if all their food and water were sourced from the locality where the deposition of dioxins, furans and dioxin like PCB's 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 Applicant has considered the possible effects on human health at the point of maximum impact of annual mean emissions within the modelling domain, which occurs at NGR ST 52500 80690. This uninhabited point, located approximately 0.3km northeast of the proposed installation has been identified as the 'sensitive receptor' for the purposes of the human health risk assessment because all of the residential receptors identified in the Applicant's assessment lie outside of the modelling domain. The Applicant has based their assessment on the assumption that a 'farmer' and a 'residential' receptor occur at this point, stating that this represents a complete worst case, while they expect impacts at the actual residential receptors to be considerably lower.

The results of the Applicant's assessment of intake of dioxins, furans and dioxin like PCB's are detailed in the table below. The results show that the predicted daily intake at all receptors, resulting from emissions from the proposed facility, are significantly below the recommended TDI levels.

Receptor	Adult	% of TDI	Child	% of TDI
Farmer	0.0068	0.34	0.0096	0.48
Resident	0.0002	0.01	0.0006	0.03

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

We have undertaken check modelling for the human intake of dioxins, furans and dioxin like PCBs. Making conservative assumptions about dietary intake and following default screening parameters, our checks are significantly lower than those presented by the Applicant. This is due to overly conservative assumptions made by the Applicant in their assessment. Our checks confirm that intake is highly unlikely to be any greater than those predicted by the Applicant.

We therefore consider the intake of dioxins, furans and dioxin like PCB's resulting from operation of the proposed Installation to be insignificant, and believe it is unlikely that the COT TDI level of 2 picograms I-TEQ / Kg bodyweight/ day will be exceeded.

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. In 2001, the average daily intake by adults in the UK from diet was 0.9 pg WHO-TEQ/kg bodyweight. The additional daily intake predicted by the modelling as shown in the table above is substantially below this figure.

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

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

5.3.3 Particulates smaller than 2.5 microns

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

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

The HPA 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. The HPA notes that the coefficients that allow the use of number concentrations in impact calculations have not yet been defined because the national experts have not judged that the evidence is sufficient to do so. This is an area being kept under review by COMEAP.

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

The HPA 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. The HPA note 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 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.”

In carrying out air dispersion modelling as part of the H1 Environmental Impact assessment and comparing the predicted environmental concentrations with European and national air quality standards, the Applicant has effectively made a health risk assessment for many pollutants. These air quality standards have been developed primarily in order to protect human health.

The Applicant’s assessment of the impact from nitrogen dioxide, PM_{10}, $PM_{2.5}$, hydrogen chloride, hydrogen fluoride, carbon monoxide, PAH (as benzo(a)pyrene), PCBs, mercury, lead, copper, manganese, vanadium and chromium have all indicated that the Installation emissions screen out as insignificant. Although the impact of emissions of VOC, cadmium, arsenic and nickel 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. Additional detailed assessment of emissions of Chromium VI was undertaken which determined that this emission is also likely to be insignificant.

The Environment Agency has reviewed the methodology employed by the Applicant to carry out the health impact assessment. Generally, we found the Applicant’s assessment methodology to be acceptable. Based on the IED limit values and the Applicant’s assumptions, our check modelling indicated that the Applicant’s conclusions are acceptable at the selected receptors.

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 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 was 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, as was the Director of Public Health at Bristol City Council, but neither made a consultation response. Details of the response 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, dioxin like PCBs 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.

The Applicant has undertaken a conservation assessment, comparing the PC against relevant Critical Level and Critical Loads for the designated conservation sites.

Critical Levels for the protection of vegetation are defined as gaseous concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur. Critical Levels have been established for Oxides of nitrogen, Sulphur dioxide and hydrogen flouride.

Critical Loads relate to the quantity of pollutant deposited from air to the ground. It is defined as a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on sensitive elements of the environment do not occur. Critical loads (long term only) have been set for nutrient-N deposition and acid deposition (N and S).

Environment Agency guidance states that for statutory conservation sites (SAC/SPA/Ramsar/SSSI) a pollutant is deemed to be insignificant if the long term PC is less than 1% of the Critical Level and/or Load. Where the long term PC is greater than 1% but the PEC is less than 70% of the Critical Level and/or Load we can conclude that there will be either (a) no likely significant effect (SPA / Ramsar), or (b) no damage caused (SSSI), to the designated site. Short term emissions are deemed to be insignificant where the short term PC is less than 10% of the Critical Level.

For non-statutory conservation sites, our guidance states that long term and short term emissions are considered insignificant where the predicted PC is less than 100% of the relevant benchmark. In this case we can conclude that the proposed emissions will not result in significant pollution of the site.

5.4.1 Sites Considered

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

- Severn Estuary SAC/SPA/Ramsar
- Avon Gorge Woodlands SAC

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

- Severn Estuary SSSI

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

- Moorhouse Farm and Stuppill Rhines
- Kings Weston Lane Rhine
- Hallen Marsh Junction

- Avonmouth Sewage Works and Hoar Gout
- St. Andrews Road Rhine
- Lawrence Weston Road Rhines
- Salt Rhine and Moorhouse Rhine
- Severn Estuary
- Severn Estuary SSSI (part of) - New Passage to Chittening Warth.

5.4.2 Habitats Assessment

The Applicant's Habitats assessment was reviewed by the Environment Agency's specialists for air quality modelling, who agreed with the assessment's conclusions, that there would be no likely significant effect on the interest feature(s) of the protected site(s).

The results of the Applicant's Habitats assessment against Critical Levels is set out in the table below.

Pollutant	**Critical Level CLe ($\mu g/m^3$)**	**Standard (see below)**	**PC ($\mu g/m^3$)**	**PC as % of Critical Level**
Receptor - Severn Estuary SAC / SPA / Ramsar				
NO_x (as NO_2)	30	1	0.2098	0.70
	75	2	2.81	3.75
SO_2	20	1	0.0524	0.26
Hydrogen fluoride	5	2	0.0140	0.28
	0.5	3	0.0068	1.36
Receptor - Avon Gorge Woodlands SAC				
NO_x (as NO_2)	30	1	0.0055	0.02
	75	2	0.12	0.16
SO_2	20	1	0.0013	0.01
Hydrogen fluoride	5	2	0.00059	0.01
	0.5	3	0.00029	0.06

1 Annual mean
2 Daily mean
3 Weekly mean

From the table above all emissions can be screened out as insignificant in that the PC < 1% of the long term Critical Level and/or <10% of the short term Critical Level, with the exception of the weekly mean emission of hydrogen fluoride. However, given that the PC is only marginally above the 1% insignificance threshold we do not expect that the emission would result in an exceedance of the Critical Level.

The results of the Applicant's Habitats assessment against Critical Loads is set out in the table below. The Applicant assessed all habitat types within each designated site for which a Critical Load was available. Only the results for the lowest Critical Load for each site is included below, presenting the likely worst case scenario. The Severn Estuary SAC/SPA/Ramsar is not considered sensitive to acid deposition from aerial sources and so was not considered in this assessment.

Pollutant	Lowest available habitat specific Critical Load (CLo)	PC	PC as % of Critical Load
Receptor - Severn Estuary SAC / SPA / Ramsar			
Nutrient nitrogen deposition	20 kg N/ha/yr	0.021 kg N/ha/yr	0.11
Receptor - Avon Gorge Woodlands SAC			
Nutrient nitrogen deposition	15 kg N/ha/yr	0.001 kg N/ha/yr	0.006
Acid deposition (N and S)	1.219 keq N/ha/yr	0.00008 keq N/ha/yr	0.007
	1.077 keq S/ha/yr	0.00033 keq S/ha/yr	0.033

From the table above all emissions can be screened out as insignificant in that the PC < 1% of the Critical Load.

More comprehensive details of our assessment of impact on the Habitat sites is recorded in our Appendix 11 assessment document which concluded that emissions from the proposed Installation will not have any likely significant effect on the features of the Habitat sites. We did not formally consult on this assessment but did send our Appendix 11 to Natural England for information only. This decision was taken in accordance with our guidance.

We are therefore satisfied that the Applicants assessment of impact on the relevant Habitat sites is satisfactory and consider that the operation of the proposed Installation will not have an adverse effect on the features of these Habitat sites.

5.4.3 SSSI Assessment

The Applicant's SSSI assessment was reviewed by the Environment Agency's specialists for air quality modelling, who agreed with the assessment's conclusions. The proposed emissions are not likely to cause damage to the designated site(s).

The results of the Applicant's SSSI assessment against Critical Levels is set out in the table below.

Pollutant	Critical Level	Standard	PC	PC

	CLe ($\mu g/m^3$)	(see below)	($\mu g/m^3$)	as % of Critical Level
Receptor - Severn Estuary SSSI				
NO_x (as NO_2)	30	1	0.2098	0.70
	75	2	2.81	3.75
SO_2	20	1	0.0524	0.26
Hydrogen fluoride	5	2	0.0140	0.28
	0.5	3	0.0068	1.36

1 Annual mean
2 Daily mean
3 Weekly mean

From the table above all emissions can be screened out as insignificant in that the PC < 1% of the long term Critical Level and/or <10% of the short term Critical Level, with the exception of the weekly mean emission of hydrogen fluoride. However, given that the PC is only marginally above the 1% insignificance threshold we do not expect that the emission would result in an exceedance of the Critical Level.

The results of the applicant's SSSI Habitats assessment against Critical Loads is set out in the table below.

Pollutant	Lowest available habitat specific Critical Load (CLo)	PC	PC as % of Critical Load
Receptor - Severn Estuary SSSI			
Nutrient nitrogen deposition	20 kg N/ha/yr	0.021 kg N/ha/yr	0.11
Acid deposition (N and S)	0.963 kg N/ha/yr	0.0015 kg N/ha/yr	0.15
	4 kg S/ha/yr	0.0062 kg S/ha/yr	0.15

From the table above all emissions can be screened out as insignificant in that the PC < 1% of the Critical Load.

More comprehensive details of our assessment of impact on the Habitat site is recorded in our Appendix 4 assessment document which concluded that emissions from the proposed Installation would not damage the designated site. We did not formally consult on this assessment, this decision being taken in accordance with our guidance.

We are therefore satisfied that the Applicants assessment of impact on the relevant SSSI is satisfactory and consider that the operation of the proposed Installation will not have an adverse effect on the features of the site.

5.4.4 Assessment of Non-Statutory Sites

The Applicant's non-statutory sites assessment was reviewed by the Environment Agency's specialists for air quality modelling, who agreed with the assessment's conclusions. The proposed emissions are not likely to result in significant pollution of the designated site(s).

The results of the Applicant's non-statutory sites assessment against Critical Levels is set out in the table below. Note that as the non-statutory sites, Severn Estuary, and Severn Estuary SSSI (part of) - New Passage to Chittening Warth, fall within the larger designated sites considered in the previous sections, they have not been included in this section.

Pollutant	Critical Level CLe (µg/m³)	Standard (see below)	PC (µg/m³)	PC as % of Critical Level
Receptor - Moorhouse Farm and Stuppil Rhines				
NO_x (as NO_2)	30	1	0.03	0.10
	75	2	0.41	0.54
SO_2	20	2	0.00755	0.04
Hydrogen flouride	5	2	0.00200	0.04
	0.5	3	0.00058	0.12
Receptor - Kings Weston Lane Rhine				
NO_x (as NO_2)	30	1	0.02	0.07
	75	2	0.39	0.52
SO_2	20	2	0.00520	0.03
Hydrogen fluoride	5	2	0.00197	0.04
	0.5	3	0.00067	0.13
Receptor - Hallen Marsh Junction				
NO_x (as NO_2)	30	1	0.52	1.73
	75	2	2.22	2.96
SO_2	20	2	0.12941	0.65
Hydrogen fluoride	5	2	0.01110	0.22
	0.5	3	0.00653	1.31
Receptor - Avonmouth Sewage Works and Hoar Gout				
NO_x (as NO_2)	30	1	0.05	0.18
	75	2	0.97	1.29
SO_2	20	2	0.01353	0.07
Hydrogen fluoride	5	2	0.00484	0.10
	0.5	3	0.00150	0.30

Pollutant	Critical Level CLe ($\mu g/m^3$)	Standard (see below)	PC ($\mu g/m^3$)	PC as % of Critical Level
Receptor - St. Andrews Road Rhine				
NO_x (as NO_2)	30	1	0.30	0.99
	75	2	2.38	3.17
SO_2	20	2	0.07432	0.37
Hydrogen fluoride	5	2	0.01188	0.24
	0.5	3	0.00795	1.59
Receptor - Lawrence Weston Road Rhines				
NO_x (as NO_2)	30	1	0.03	0.08
	75	2	0.36	0.48
SO_2	20	2	0.00626	0.03
Hydrogen fluoride	5	2	0.00178	0.04
	0.5	3	0.00062	0.12
Receptor - Salt Rhine and Moorhouse Rhine				
NO_x (as NO_2)	30	1	0.33	1.10
	75	2	1.59	2.12
SO_2	20	2	0.08282	0.41
Hydrogen fluoride	5	2	0.00796	0.16
	0.5	3	0.00440	0.88

1 Annual mean
2 Daily mean
3 Weekly mean

The results of the Applicant's Non-Statutory Sites assessment against Critical Loads is set out in the table below.

Pollutant	Lowest available habitat specific Critical Load (CLo) [1]	PC	PC as % of Critical Load
Receptor - Moorhouse Farm and Stuppil Rhines			
Nutrient nitrogen deposition	20 kg N/ha/yr	0.003 kg N/ha/yr	0.015
Acid deposition (N and S)	0.85 keq N/ha/yr	0.00022 keq N/ha/yr	0.025
	3.88 keq S/ha/yr	0.00121 keq S/ha/yr	0.031
Receptor - Kings Weston Lane Rhine			
Nutrient nitrogen	20	0.002	0.010

Pollutant	Lowest available habitat specific Critical Load (CLo) [1]	PC	PC as % of Critical Load
deposition	kg N/ha/yr	kg N/ha/yr	
Acid deposition (N and S)	0.85 keq N/ha/yr	0.00015 keq N/ha/yr	0.017
	3.88 keq S/ha/yr	0.00084 keq S/ha/yr	0.021
Receptor - Hallen Marsh Junction			
Nutrient nitrogen deposition	20 kg N/ha/yr	0.052 kg N/ha/yr	0.261
Acid deposition (N and S)	0.85 keq N/ha/yr	0.00373 keq N/ha/yr	0.438
	3.88 keq S/ha/yr	0.02080 keq S/ha/yr	0.536
Receptor - Avonmouth Sewage Works and Hoar Gout			
Nutrient nitrogen deposition	20 kg N/ha/yr	0.005 kg N/ha/yr	0.027
Acid deposition (N and S)	0.85 keq N/ha/yr	0.00039 keq N/ha/yr	0.045
	3.88 keq S/ha/yr	0.00217 keq S/ha/yr	0.055
Receptor - St. Andrews Road Rhine			
Nutrient nitrogen deposition	20 kg N/ha/yr	0.030 kg N/ha/yr	0.150
Acid deposition (N and S)	0.85 keq N/ha/yr	0.00214 keq N/ha/yr	0.251
	3.88 keq S/ha/yr	0.01195 keq S/ha/yr	0.307
Receptor - Lawrence Weston Road Rhines			
Nutrient nitrogen deposition	20 kg N/ha/yr	0.003 kg N/ha/yr	0.013
Acid deposition (N and S)	0.85 keq N/ha/yr	0.00018 keq N/ha/yr	0.021
	3.88 keq S/ha/yr	0.00101 keq S/ha/yr	0.026
Receptor - Salt Rhine and Moorhouse Rhine			
Nutrient nitrogen deposition	20 kg N/ha/yr	0.033 kg N/ha/yr	0.167
Acid deposition	0.85	0.00239	0.281

Pollutant	Lowest available habitat specific Critical Load (CLo) [1]	PC	PC as % of Critical Load
(N and S)	keq N/ha/yr	keq N/ha/yr	
	3.88 keq S/ha/yr	0.01331 keq S/ha/yr	0.343

We consider that the Applicant's assessment of impact on non-statutory sites is satisfactory. In all cases the Process Contribution is less than 100% of the relevant Critical Level or Critical Load and therefore we can conclude that none of the sites will suffer significant pollution due to the emission of gaseous pollutants from the proposed installation.

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.

The Applicant has cited the following examples of potential abnormal operating conditions which may lead to 'abnormal emission levels' of pollutants:

- Reduced efficiency of lime injection system such as through blockages or failure of fans leading to elevated acid gas emissions (with the exception of hydrogen chloride)
- Complete failure of the lime injection system leading to unabated emissions of hydrogen chloride
- Reduced efficiency of particulate filtration system due to bag failure and inadequate isolation, leading to elevated particulate emissions and metals in the particulate phase
- Combustion disturbances, leading to elevated oxides of nitrogen emissions
- Complete failure of the activated carbon injection system and loss of temperature control leading to high levels of dioxin reformation and their unabated release

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).

Given that 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 EQS. For the most part therefore consideration of abnormal operations is limited to consideration of its impact on short term EQSs.

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

- NO_x emissions of 600 mg/m^3 (1.5 x normal half hour average limit)
- Particulate emissions of 150 mg/m^3 (5 x normal half hour average limit)
- SO_2 emissions of 500 mg/m^3 (2.5 x normal half hour average limit)
- HCl emissions of 900 mg/m^3 (15 x normal half hour average limit)
- HF emissions of 90 mg/m^3 (22.5 x normal half hour average limit)
- Dioxin emissions of 10 ng/m^3 (100 x normal half hour average limit)
- Mercury emissions are 100 times those of normal operation
- Metal emissions other than mercury are 5 times those of normal operation.

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

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

Pollutant	EQS / EAL		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m³		µg/m³	µg/m³	% of EAL	µg/m³	% of EAL
NO_2	200	2	62.2	8.7	4.35	70.9	35.5
PM_{10}	50	3	31.34	1.1	2.20	32.44	64.9
SO_2	266	4	13.1	27.6	10.38	40.7	15.3
	350	5	13.1	17.6	5.03	30.7	8.8
HCl	750	6	1.06	64.7	8.63	65.8	8.77
HF	160	6	4.7	6.5	4.06	11.20	7.0
Hg	7.5	1	0.00432	0.359	4.79	0.36332	4.844
Sb	150	1	-	0.005	0.0033	-	-
Cu	200	1	0.0109	0.016	0.0080	0.02690	0.013
Mn	1500	1	0.0124	0.005	0.0003	0.01740	0.0012
Cr (II)(III)	150	1	0.0029	0.013	0.0087	0.01590	0.0106

1 1-hr Maximum
2 99.79th %ile of 1-hour means
3 90.41st %ile of 24-hour means
4 99.9th ile of 15-min means
5 99.73rd %ile of 1-hour means
6 1-hour average

From the table above all of the emissions can still be considered insignificant, in that the PC is still <10% of the short-term EQS/EAL. Given the very marginal increase above threshold of SO_2 (15-min mean) we consider it reasonable to include that emission within the ‘insignificant emissions’ group.

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 EQSs for the reasons set out above. Except that if dioxin emissions were at 10 ng/m^3 (100 x normal operation) for the maximum period of abnormal operation (60 hours/annum), this would result in an increase of approximately 68% in the TDI reported in section 5.3.3. In these circumstances the TDI would be 0.0114 pg (I-TEQ/ kg-BW/day) for a Farmer - Adult , which is 0.57% of the COT TDI and 0.0161 pg(I-TEQ/ kg-BW/day) for a Farmer - Child, which is 0.80% of the COT TDI. At this level, emissions of dioxins will still not pose a risk to human health.

In addition to the Applicant’s consideration of abnormal emissions as set out above, they have also made an assessment of unabated emissions from the plant’s Emergency Relief Vent (ERV). This is an emergency bypass system, which allows flue gases from the secondary combustion chamber to pass directly to atmosphere via a 35 metre high emergency vent stack. This system is an emergency fail-safe, designed to protect the plant and the surrounding areas. The Applicant states that ERV can be initiated for any of the following reasons:

- Loss of electrical power (e.g. power cuts)
- Failure of the ID fan
- Very low boiler water level
- High baghouse plant temperatures
- Manual initiation of emergency stop.

In response to any of these emergency situations, the plant will go into emergency shutdown. The bypass system operates via the ERV, with an interlock preventing the charging of waste to the furnace until normal operating conditions are restored. After 30 minutes of operation, it is stated that combustion in the primary chamber will have virtually ceased.

We considered it appropriate to assess releases from the ERV. The Applicant calculated short-term pollutant PCs based on emission concentrations they claimed were likely under completely unabated conditions. For all pollutants, with the exception of NOx and PM_{10} we considered that their “raw” emission concentrations were consistent with expected values (as seen from other similar applications). We carried out sensitivity checks using more appropriate (higher) values where appropriate.

We have concluded that the overall risk from the operation of the ERV is low and that no exceedances of any air quality standards are likely. The operator will be required to report to the Environment Agency any periods of operation of the ERV in accordance with table S4.3 of the permit.

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: TOC, Cadmium, Arsenic, Nickel and Chromium VI.

- 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.

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 NOx as the furnace choice could have an effect on the amount of unabated NOx produced
- energy consumption – whole plant, waste preparation, effect on GWP
- need, if any, for further processing of residues to comply with TOC
- costs

<u>Summary comparison of thermal treatment technologies</u> (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: waste treatable better Combustion control possible.	As air-cooled grates but: risk of grate damaging leaks and □□ 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 more limited than grate (owing to refractory damage) applied to hazardous Wastes	<10 t/h	Very well proven with broad range of wastes and burn good 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 / 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) □ 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	□□ pretreated 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 not undertaken a review of candidate furnace types because the proposal involves the relocation of an existing furnace from another one of the Applicant’s clinical waste incineration sites.

The proposal involves the use furnace technology comprising a stepped hearth design, including a secondary combustion chamber, which is identified in the table above as being considered BAT in the BREF or TGN for this type of waste feed.

The Applicant proposes to use natural gas as support fuel for start-up, shut down and for firing the auxiliary burners and we are satisfied that this is BAT for the facility.

6.1.2 Validation of combustion conditions

The Applicant reports that the proposed furnace has already been validated for combustion conditions achieving a residence time of over 2 seconds and a minimum temperature of 850°C, as described in the former Waste Incineration Directive. They state that the plant continues to demonstrate compliance with the combustion related emission limit values (ELVs), however prior to set up and commencement of operation at the new site, these parameters will be verified against the relevant criteria utilising one of the options listed in our Technical Guidance Note, S5.01.

We consider this to be acceptable and have included a Pre-operational measure, ref. PO4, in the permit requiring that prior to operation, the Applicant provides a report describing how they have re-validated the combustion conditions of the plant, such that the requirements of our guidance are met.

6.1.3 Boiler Design

The Applicant proposes a three-pass waste heat boiler with economiser, prior to the flue gas treatment system. In accordance with our Technical Guidance Note, S5.01, 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:

- cooling of the gases as quickly as possible to below 200°C; and
- careful control of temperature at the steam/metal heat transfer surface such that the temperature is a minimum where the exhaust gases are within the de-novo synthesis range.

We have considered the assessments made by the Applicant and agree that the furnace technology chosen represents BAT.

6.2 BAT and emissions control

The prime function of flue gas treatment is to reduce the concentration of pollutants in the exhaust gas as far as practicable. The techniques which are described as BAT individually are targeted to remove specific pollutants, but the BREF notes that there is benefit from considering the flue-gas treatment (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 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 5mg/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	May “blind” more than fabric filters		Small plant. High

Particulate matter				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
	Smaller plant.			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 assessed as insignificant, and so the Environment Agency agrees that the Applicant's proposed technique is BAT for the installation.

6.2.2 Oxides of Nitrogen

Oxides of Nitrogen : Primary Measures				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Low NOx burners	Reduces NOx at source		Start-up, supplementary firing.	Where auxiliary burners required.
Starved air systems	Reduce CO simultaneously.			Pyrolysis, Gasification systems.
Optimise primary and secondary air injection				All plant.
Flue Gas Recirculation (FGR)	Reduces the consumption of reagents used for secondary NOx control. May increase overall energy recovery	Some applications experience corrosion problems.		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)	NOx emissions < 70mg/ m^3 Reduces CO, VOC, dioxins	Expensive. Re-heat required – reduces plant efficiency		All plant
Selective non-catalytic reduction (SNCR)	NOx 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 NOx 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:

- Optimise primary and secondary air injection – this technique is BAT for all plant
- Water sprays to control temperatures, and benefit NO_x reduction
- Operation of site in order to maintain good waste loading regimes

The Applicant does not propose to incorporate Flue Gas Recirculation (FGR) into the proposed design. 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. While the technique is considered BAT for all plant, the Applicant has stated that they do not believe that there will be any issues achieving the compliance limit for NOx without FGR. They point towards the proposed validation of the plant to help ensure that it is operating within the designated envelope.

Furthermore, the Applicant does not propose to utilise low NOx auxiliary burners, which is considered BAT where auxiliary burners are used. They state that the auxiliary burners are normally only operated during start-up and shut-down periods, with temperatures otherwise being maintained during operation through the waste blending regimes. They contend that from their experience with their other clinical waste incinerators, low NOx burners would offer negligible benefit to the Installation.

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 deg 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. Either reagent is BAT, and the use of one over the other is not normally significant in environmental terms.

The Applicant does not propose to incorporate any secondary measures in the proposed design. They state that they do not believe that there will be any issues achieving the compliance limit for NOx.

We questioned the Applicant on this point given that several of their other incinerators are only required to achieve former WID daily limits of 350 mg/m^3 or 400 mg/m^3 respectively, not the more stringent IED daily limit of 200 mg/m^3. The Applicant confirmed that every effort would be made to ensure that the plant achieves the NOx limit of 200mg/m^3, and that they would demonstrate this during the commissioning period.

We have considered the operator's NOx monitoring data from their existing incinerator in Nottingham, which operates with no secondary abatement. The data demonstrates that the plant is capable of meeting the proposed daily mean permit limit of 200mg/m^3, with the maximum daily mean concentration recorded for the months of September, October and November 2014 being 189, 184 and 180mg/m^3 respectively. This recent data showed a significant 'step-change' improvement in the performance of the plant. The Applicant reported that this was achieved by re-balancing of the plant through adjustments to the combustion air feed and through routine maintenance. They confirmed that these measures will be continue to be operated when the Nottingham plant is relocated to Bristol.

We have included an Improvement Condition (IC4) requiring the Operator to submit a report which describes the performance and optimisation of the abatement system and/or combustion settings to minimise oxides of nitrogen (NO_x) emissions within the emission limit values in the permit. The report is to include an assessment of the level of NO_x emissions that can be achieved under optimum operating conditions.

Based on the performance of the existing plant as mentioned above, and because emissions of NO_x have previously been assessed as insignificant, the Environment Agency accepts that the Applicant's proposed technique can be considered BAT for the installation.

6.2.3 Acid Gases, SO_x, HCl and HF

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

Acid gases and halogens : Secondary Measures (BAT is to apply Primary Measures first)

Technique	Advantages	Disadvantages	Optimisation	Defined as BAT in BREF or TGN for:
Wet	High reaction rates Low solid residues production Reagent delivery may be optimised by concentration and flow rate	Large effluent disposal and water consumption if not fully treated for re-cycle Effluent treatment plant required May result in wet plume Energy required for effluent treatment and plume reheat		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	Corrosive material ETP sludge		HWIs

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:**
	waste production	for disposal		
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 – natural gas is proposed to be used, thereby reduce SO_x at source.
- Management of heterogeneous wastes – this will disperse problem wastes such as PVC by optimising waste blending to ensure 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. Either reagent is 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 utilise dry hydrated lime. This reagent is also used at the other incinerators operated by the Applicant. They state that the lime utilised by the company has a greater surface area allowing for better absorption, with the optimum efficiencies achieved at the operating parameters. The amount of lime injected will vary depending upon levels of hydrogen chloride and sulphur dioxide present in the flue gas, thereby reducing raw material usage. The Environment Agency is satisfied that this system is BAT, in accordance with guidance EPR5.01.

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.

The permit does not allow for the incineration of mercury containing wastes, such as dental amalgam, in accordance with our guidance S5.01. 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.

6.2.7 Stack height

The Applicant carried out an assessment of the effect of different stack heights on Process Contributions (PCs) and Predicted Environmental

Concentrations (PECs), with stacks ranging from 20m to 50m. As the pollutant of greatest potential concern is oxides of nitrogen the assessment was based on the annual mean modelling results for NO_x (NO_2). Results for the point of maximum ground level concentration and for receptor points within the Severn Estuary SAC/SPA/Ramsar & SSSI were compared with the relevant environmental benchmark.

The results showed that the minimum stack height required was 26m but that beyond this there was still beneficial reductions in pollutant concentrations to be gained with additional height. This benefit noticeably decreased at about 40m stack height, such that increases in height beyond 40m made only a very marginal difference to pollutant concentrations. The Applicant therefore proposed a stack height of 40m, stating that this was unlikely to result in significant impacts on the local environment. This stack height was incorporated into their air emissions modelling. We have considered the Applicant's assessment and undertaken our own check calculations. We are satisfied that the selected stack height is reasonable and can be considered BAT for the Installation.

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 major source of greenhouse gas emissions from the installation is 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 Applicant has therefore included within its GWP calculations a CO_2 offset for the net amount of electricity exported from the Installation.

Taking this into account, the net emissions of CO_2 from the installation are estimated at 10,675 tonnes per annum. At this level emissions cannot be characterised as insignificant. The Installation is not subject to the Greenhouse Gas Emissions Trading Scheme Regulations 2003; therefore it is a requirement of IED to investigate how emissions of greenhouse gases emitted from the installation might be prevented or minimised.

The Applicant has considered GWP as part of its BAT options appraisal. There are a number of areas in which a difference can be made to the GWP of the Installation. In summary: the following factors influence the GWP of the facility:-

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.

Overall the emissions of CO_2 are estimated as follows:-

Burning of Waste	10,759
Burning of Auxiliary Fuel	0.06
Electricity Imported from the Grid	0.34
Total	10,759

On the credit side

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

Electricity Exported	- 84

This value is based on 0.058 MW (508 MWh) of electricity being exported from the Installation with a CO_2 equivalence factor of 0.166 tonnes per MWh.

The net GWP is therefore 10,675 tonnes of CO_2, which is equivalent to approximately 1.6 tonnes of CO_2 per tonne of waste incinerated.

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.

The Applicant's assessment shows that the GWP of the plant is dominated by the emissions of carbon dioxide that are released as a result of waste combustion, and this will be the same for all thermal treatment technologies. The BREF quotes a range of 0.7 to 1.7 tonnes of CO_2 per tonne of municipal waste. The performance of the proposed clinical waste incinerator is within the BREF range albeit at the upper (less efficient) end of the spectrum, which is due to the limited energy recovery of the plant. As mentioned previously the Applicant proposes to keep under review the potential for greater energy recovery within the local area, with regard to waste heat.

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) and
- PeCB (pentachlorobenzene)

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

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

> "Member States shall, when considering proposals to construct new facilities or 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. EPR requires that, in addition to the requirements of the IED, the WHO-TEQ values for both dioxins and dioxin-like PCBs should be specified for monitoring and 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. We require monitoring of a range of PAHs and dioxin-like PCBs in waste incineration Permits 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 identified by Defra in the Environmental Permitting Guidance on the IED. 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 5.3 of this document details the assessment of emissions to air, which includes dioxins and concludes that there will be no adverse effect on human health from either normal or abnormal operation.

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

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

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

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

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

6.5 Other Emissions to the Environment

6.5.1 Emissions to water

There are no direct emissions to surface water from the proposed installation. 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

Emissions to foul sewer during normal operation of proposed installation will comprise of the following:

- boiler blow down effluent
- washwater from the process of cleaning the waste containers
- domestic sewage from staff welfare facilities, i.e. toilets.

The applicant has also stated that the fire fighting water required in emergency situations will also be discharged to foul sewer, following temporary storage in the ash pit, which will be designed accordingly for this purpose.

The Applicant has confirmed that they will apply to the sewerage undertaker for the trade effluent discharge consent to cover discharge of these effluents, and will undertake any monitoring as required by the consent.

Material Safety Data Sheets (MSDS) have been submitted by the Applicant for the proprietary boiler water treatment chemicals and the waste cart washing detergent. We have considered the composition of the proposed chemicals and do not consider them to be 'hazardous pollutants' as defined within our permitting guidance. Furthermore the cart washing detergent is a biodegradable product. We are therefore satisfied that additional risk assessment is not required and that control via trade effluent consent will provide an appropriate level of environmental protection.

The emission point to sewer, reference S1, has been included in Table S3.2 of the permit.

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 has described the range of control measures that they propose for control of fugitive emissions, based on best practice developed across their business which includes the operation of nine other clinical waste incinerators. They have described the proposed control measures associated with the following operational areas:

- waste reception and storage
- furnace loading systems
- primary combustion chamber and associated equipment
- secondary combustion chamber and associated equipment
- boiler and boiler cleaning activities
- reactor tower and baghouse
- induced draft fan and stack
- lime silo, lime deliveries and dosing
- dosing of powdered activated carbon
- bottom ash and spent lime
- chemicals usage and storage
- steam systems
- retention of fire fighting water
- general site area.

The Applicant has submitted initial volumetric based estimates of the size of ash pit required to retain up to two hours of fire fighting water at maximum flows. They state that the final design of the system shall be confirmed at the detailed design stage by a suitably qualified fire systems engineer. We have included a pre-operational measure PO5 requiring the Applicant to submit confirmation of the final design for approval.

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

6.5.4 Odour

The Applicant proposes to minimise odour releases by utilising the following controls:

- Waste will be delivered in UN approved containers and stored in locked carts to prevent the escape of odours
- Furnace priority is given to putrescible wastes and to wastes which have been on site for the most time
- Good control of waste rotation
- Carts will only be opened immediately before being incinerated; and
- Every shift, a site check will be carried out to identify whether there are any problems.

All waste from customer sites will be received in specially designed bespoke and labelled heavy duty bags or containers. Waste from large producers, will be placed into an enclosed wheeled cart, which acts as a secondary container. For smaller waste producers, the waste will be placed into wheeled carts when off-loading waste at site. The bags and containers will be discharged directly from the wheeled carts and will be destroyed in the incineration process. The wheeled carts off-loaded from the process are directed to the queue for immediate incineration or into the intermediate storage area and scheduled for incineration or transfer.

In addition the potential for odour release will be minimised by appropriate management of the waste charging process, the regular inspection and maintenance of seals, and the operation of the system under negative pressure to draw gases through the system.

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

6.5.5 Noise and vibration

A Noise and Vibration Assessment was submitted with the application, showing the likely noise emissions arising from the installation and the control measures proposed to reduce the associated impact.

The Applicant identified the neighbouring business unit(s) / offices as the nearest noise sensitive receptor to the proposed installation. There are no schools or residential areas in the immediate vicinity of the proposed installation. The nearest residential receptor is located approximately 2.3km to the south. Given the location, the background noise will largely be characterised by various industrial sources and road traffic.

Noise measurements for similar plant items in use at the Applicant's other sites were provided to give an indication of the likely noise levels (prior to mitigation). Noise will principally be emitted from the following areas:

- Waste loading/unloading area (vehicle reception)
- Bin loading and ram mechanism into incinerator
- Primary, secondary fans and ID fan
- Harmonics between ID fan and stack
- Bin washing unit
- Abatement plant - lime feed screw
- Operation of the ERV
- MCC room (PLC control panel)
- Air vibrators, compressors and condensers

The Applicant states that noise levels at the boundary of the proposed building will be within the range of 45dBA to 62dBA prior to mitigation, and significantly less with the proposed control measures in place. A range of mitigation measures are proposed, including the use of noise enclosures, acoustic cladding, and exhaust silencers on exhausts, along with regular inspection and maintenance. We consider that these proposals are in broad accordance with the hierarchy for control stated in our guidance 'Horizontal Guidance Note, IPPC H3 (Part 2) – Noise Assessment and Control', which includes, in order of priority:

- Prevent generation of noise at source by good design and maintenance
- Minimise or contain noise at source by observing good operational techniques and management practice
- Use physical barriers or enclosures to prevent transmission to other media.

The Applicant requires further planning permission for the two chimney stacks (i.e. the main stack and the ERV), the air coolers and an access stairway. As part of our determination we have consulted with the local planning authority, Bristol City Council, who have indicated that they have received a planning application for these elements of the development. Their response included the following comments:

"We are aware of the potential noise impact of the new chimneys and are currently dealing with a planning application for the chimneys (13/05267/F). Please be aware that the Council will be attaching the following planning condition to the planning application:

- *The Rating Level of any noise from any fixed plant shall not exceed the pre-existing background noise level by more than 5 dB at any time at residential properties and 6dBA at any sensitive industrial use as determined by BS 4142: 1997 Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas.*

The existing noise conditions on the 1994 permission for the incinerator are poorly written and do not offer adequate control for noise nuisance to all potential sensitive uses in the area."

The Applicant has confirmed that they will undertake a noise assessment prior to operation to provide both baseline and emissions arising from the facility. We have included pre-operational condition PO6 requiring the operator to submit a noise and vibration monitoring plan for the site during both commissioning and operation. Improvement Condition IC7 requires the operator to carry out and report on the monitoring proposed under PO6.

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. Our permit will include the standard conditions concerning noise and vibration to ensure that in practice, should the proposed plant lead to noise levels likely to cause pollution outside the site, we have specific measures within the permit to deal with it.

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).

(i) Local factors

We have considered the impact on local receptors and habitat conservation sites for those emissions not screened out as insignificant and do not consider it necessary to impose further conditions, or set more stringent emission limits than those specified by IED, Chapter IV.

(ii) National and European EQSs

There are no additional National or European EQSs that indicate that IED, Chapter IV limits are insufficient to protect the local environment.

(iii) Global Warming

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

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

(iv) Commissioning

Before the plant can become fully operational it will be necessary for it to be commissioned. Before commissioning can commence the Operator is required by pre-operational condition PO3 to submit a commissioning plan to the Agency for approval. Commissioning can only begin and be carried out in accordance with the approved proposals in the plan.

In addition, it is recognised that certain information presented in the Application was based on design data, or data from comparable equipment, and that the commissioning phase is the earliest opportunity to verify much of this information. The following improvement conditions have been included in the permit so that appropriate verifications will be determined by the Applicant:

- Calibration of CEMs in accordance with BS EN 14181 (a requirement in improvement condition IC6).

- Verification of furnace residence time, temperature and oxygen content (IC3).
- The plant in total conforms with the permit conditions and that satisfactory process control procedures for the plant have been developed (IC2).
- Abatement plant optimisation details (IC4).

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 deliver the EPR requirement that dioxin-like PCBs and PAHs should be monitored and to deliver the requirements of Chapter IV of IED for monitoring of residues and temperature in the combustion chamber.

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

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

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

The Applicant is not proposing to provide back-up CEMS. In the event that the installed CEMS fail, Condition 2.3.10 of the permit requires that the abnormal operating conditions apply.

Abnormal operation means any technically unavoidable stoppages, disturbances, or failures of the abatement plant or the measurement devices, other than continuous emission monitors for releases to air of TOC and/or CO, during which the emissions into the air may exceed the prescribed emission limit values.

In this case, the Applicant has proposed surrogate procedures for TOC and CO, in order to demonstrate likely compliance with ELV's should either of the CEMS fail. Their proposal is based on the fact that both TOC and CO are combustion gases and as such, both are controlled by maintenance of good combustion conditions within the secondary chamber. The Applicant's presumption is that if one of the values is half the limit or below, it can be safely assumed that the other value will also be well below the limit. We are in agreement and have therefore accepted the following surrogate procedures:

- For TOC, i.e. due to failure of the Flame Ionisation Detection (FID) monitor - demonstrating that the reading of CO by the MCS multigas analyser would be below 25 mg/m3 as a half-hourly average.

- For CO, i.e due to failure of the MCS multigas analyser - demonstrating that the TOC concentration, as measured by the FID, would be below 10 mg/m3 as a half-hourly average.

The Applicant has not proposed a surrogate procedure with respect to failure of the particulate CEM. Neither do they propose to install a back-up particulate CEM. Failure of the particulate CEM will therefore necessitate plant shutdown, i.e. cessation of waste feed, rather than abnormal operation, in accordance with condition 2.3.13.

6.7.3 <u>Continuous emissions monitoring for dioxins and heavy metals</u>

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. However, the continuous sampling systems do not meet the requirements of BS EN 1948 which is the standard for dioxin analysis. BS EN 1948 requires traversing the sampler across the duct and collecting parts of the sample at various points across the duct to ensure that all of the gas phase is sampled proportionately, in case there are variations in gas flow rate or composition resulting in a non-homogeneous gas flow. This requirement is particularly important where suspended solids are present in the gas, and dioxins are often associated with suspended solid particles. Continuous samplers are currently designed for operation at one or two fixed sampling points within the duct, and traverses are not carried out automatically. Using such samplers, more information could be obtained about the variation with time of the dioxin measurement, but the measured results could be systematically higher or lower than those obtained by the approved standard method which is the reference technique required to demonstrate compliance with the limit specified in the IED. The lack of a primary reference method (e.g. involving a reference gas of known concentration of dioxin) prohibits any one approach being considered more accurate than another. Because compliance with the IED's requirements is an essential element of EPR regulation, we have set emission limits for dioxins in the permit based on the use of BS EN 1948 and the manual sampling method remains the only acceptable way to monitor dioxins for the purpose of regulation.

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

7 Other legal requirements

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

7.1 The EPR 2010 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 2010 – **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 (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 this case the Applicant has confirmed that their proposals have not been subject to an environmental impact assessment under Council Directive 85/337/EEC.

7.1.2 Schedule 9 to the EPR 2010 – **Waste Framework Directive**

As the Installation involves the treatment of waste, it is carrying out a *waste operation* for the purposes of the EPR 2010, 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 allows for the mixing of hazardous wastes in the furnace. We are satisfied that the provisions of Article 13 are still complied with and the adverse impact of the waste management on human health and the environment is not increased as a result; and that the waste blending regime described in the application can be considered BAT for the facility.

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 2010 – **Groundwater, Water Framework and Groundwater Daughter Directives**

To the extent that it might lead to a discharge of pollutants to groundwater (a "groundwater activity" under the EPR 2010), 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 59 of the EPR 2010 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. This satisfies the requirements of the Public Participation Directive.

7.2 National primary legislation

7.2.1 **Environment Act 1995**

(i) Section 4 (Pursuit of Sustainable Development)

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

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

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

(ii) Section 7 (Pursuit of Conservation Objectives)

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.

We have considered the impact of the installation on local wildlife sites within 2Km which are not designated as either European Sites or SSSIs. We are satisfied that no additional conditions are required.

(iii) 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 Severn Estuary SSSI, as recorded on a CROW Appendix 4 form.

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 The Conservation of Natural 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 informed Natural England by means of an Appendix 11 assessment in accordance with our permitting guidance, that the operation of the Installation would not have a likely significant effect on the interest features of protected sites, the Severn Estuary SAC/SPA/Ramsar and the Avon Gorge Woodlands SAC.

7.3.2 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 the requirements of the Water Framework Directive through (inter alia) EP permits, but it is felt that existing conditions are sufficient in this regard and no other appropriate requirements have been identified.

7.3.3 The Persistent Organic Pollutants Regulations 2007

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

7.4 Other relevant legal requirements

7.4.1 Duty to Involve

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

The way in which the Environment Agency has consulted with the public and other interested parties is set out in section 2.2 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.

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 2.3.3 and Tables S2.2 and S2.3 in Schedule 3 of the Permit
45(1)(b)	The permit shall include the total waste incinerating or co-incinerating capacity of the plant.	Condition 2.3.3 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.	Condition 3.1.2 and Table S3.1 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 and Tables S3.1, S3.1(a), S3.2, S3.3 and S3.4.
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 to 2.3.14
46(1)	Waste gases shall be discharged in a controlled way by means of a stack the height of which is calculated in such a way as to safeguard human health and the environment.	Emissions and their ground-level impacts are discussed in the body of this document
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 S3.1(a)
46(5)	Prevention of unauthorised and accidental release of any polluting substances into soil, surface water	The application explains the measures to be in

IED Article	Requirement	Delivered by
	or groundwater. Adequate storage capacity for contaminated rainwater run-off from the site or for contaminated water from spillage or fire-fighting.	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.	Condition 2.3.13 and Table S3.1(a)
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 2.3.12
48(1)	Monitoring of emissions is carried out in accordance with Parts 6 and 7 of Annex VI.	Schedule 6 details this standardisation requirement
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 S3.3
48(3)	The competent authority shall determine the location of sampling or measurement points to be used for monitoring of emissions.	Tables S4.1 and S4.4
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
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.	Condition 3.5.5 (b) to (e)
50(1)	Slag and bottom ash to have Total Organic Carbon (TOC) < 3% or loss on ignition (LOI) < 5%.	Condition 3.5.1 and Table S3.4
50(2)	Flue gas to be raised to a	Condition 2.3.9 (a)

IED Article	Requirement	Delivered by
	temperature of 850ºC for two seconds, as measured at representative point of the combustion chamber, for non-hazardous waste or hazardous waste where the content of halogenated organic substances (as chlorine) does not exceed 1%, or 1000°C where cytotoxic or cytostatic drugs are burned.	
50(3)	At least one auxiliary burner which must not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil liquefied gas or natural gas.	Condition 2.3.10
50(4)(a)	Automatic shut to prevent waste feed if at start up until the specified temperature has been reached.	Condition 2.3.9
50(4)(b)	Automatic shut to prevent waste feed if the combustion temperature is not maintained.	Condition 2.3.9
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 2.3.9
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 every 2 years (Condition 1.2.3)
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 fulfil this requirement
51(1)	Different conditions than those laid down in Article 50(1), (2) and (3) and, as regards the temperature Article 50(4) may be authorised, provided the other requirements of this chapter are met.	No such conditions Have been allowed
51(2)	Changes in operating conditions do not cause more residues or residues with a higher content of organic polluting substances compared to those residues which could be expected under the conditions laid down in Articles 50(1), (2) and (3).	No such conditions Have been allowed

IED Article	Requirement	Delivered by
52(1)	Take all necessary precautions concerning delivery and reception of Wastes, to prevent or minimise pollution.	Conditions 2.3.1, 2.3.3, 3.2, 3.3, 3.5 and 3.6
52(2)	Determine the mass of each category of wastes, if possible according to the EWC, prior to accepting the waste.	Condition 2.3.3(a) and Table S2.2 in Schedule 2 of the Permit.
52(3)	Prior to accepting hazardous waste, the operator shall collect available information about the waste for the purpose of compliance with the permit requirements specified in Article 45(2).	Conditions 2.3.7 and 2.3.8
52(4)	Prior to accepting hazardous waste, the operator shall carry out the procedures set out in Article 52(4).	Conditions 2.3.7 and 2.3.8
53(1)	Residues to be minimised in their amount and harmfulness, and recycled where appropriate.	Conditions 3.5.1
53(2)	Prevent dispersal of dry residues and dust during transport and storage.	Conditions 1.5.1, 2.3.1 and 3.2.1
53(3)	Test residues for their physical and chemical characteristics and polluting potential including heavy metal content (soluble fraction).	Condition 3.3.1 and pre-operational condition PO2.
55(1)	Application, decision and permit to be publicly available.	All documents are accessible from the Environment Agency Public Register.

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.

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 Section 1 of How to comply with your environmental permit – Getting the basics right. 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 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 waste 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 permit compliance and assessment of its hazard status. Sampling and testing shall be carried out in accordance with the protocol as approved.
PO4	At least 2 months 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, unless previously agreed in writing by the Environment Agency.
PO5	Prior to the commencement of commissioning, the operator shall submit a written report to the Environment Agency for approval, detailing validation of combustion conditions for the furnace, in accordance with section 2.5 of Environment Agency guidance, EPR 5.01 *The Incineration of Waste* (March 2009). The report shall demonstrate whether the design combustion conditions comply with the residence time and temperature requirements as defined by the IED.
PO6	Prior to the commencement of commissioning, the operator shall submit a written report to the Agency for approval that includes 'as built' detailed site drainage plans (internal process water and external surface water, including emergency fire fighting water) and the specific design detail of the containment infrastructure at the site, including all sub-surface structures and equipment. The report shall also include an inspection and maintenance programme for the containment infrastructure and equipment at the site.
PO7	Prior to the commencement of commissioning the operator shall provide the Environment Agency with a written report for approval describing a detailed programme of noise and vibration monitoring that will be carried out at the site (a) prior to the commencement of commissioning to establish baseline

Reference	Pre-operational measures
	conditions, (b) during the commissioning stage, and (c) when the plant is fully operational. The report shall include confirmation of locations, time, frequency and methods of monitoring.
PO8	Prior to the commencement of commissioning 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.

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.

Reference	Improvement measure	Completion date
IC1	The Operator shall submit a written report to the Environment Agency on the implementation of its Environmental Management System 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 date on which waste is first burnt.
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. The proposal shall include a timetable for approval by the Environment Agency to carry out such tests and produce a report on the results. On receipt of written agreement by 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.	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.	Within 4 months of the completion of commissioning.

Reference	Improvement measure	Completion date
IC5	The Operator shall submit a written report to the Environment Agency describing the performance and optimisation of the abatement system to minimise oxides of nitrogen (NO_x) emissions within the emission limit values described in this permit. The report shall include an assessment of the level of NO_x emissions that can be achieved under optimum operating conditions. The report shall also provide details of the optimisation (including dosing rates) for the control of acid gases and dioxins.	Within 4 months of the completion of commissioning.
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, Ni and Cr VI. 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 commencement of operations
IC7	The Operator shall submit a written summary report to the 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) complies 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 commissioning.
IC8	The Operator shall carry out the monitoring approved under pre-operational condition PO7 and provide the Environment Agency with a written report of the impact of noise from the installation. In the event that the report shows that noise could have a significant impact, the report shall include proposals for the further attenuation and/or management of noise.	6 months from commencement of operations

ANNEX 4: Consultation Reponses

A) Advertising and Consultation on the Application

The Application was advertised on the Environment Agency website from 13/05/2014 to 11/06/2014. Copies of the Application were placed in the Environment Public Register at Rivers House, East Quay, Bridgwater, TA6 4YS.

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

- Natural England
- Local Authority (Bristol City Council) – Planning Department, Environmental Health Department, Director of Public Health
- Food Standards Agency
- Health & Safety Executive
- Public Health England
- National Grid

1) Consultation Responses from Statutory and Non-Statutory Bodies

Response Received from Bristol City Council (Planning Department)	
Brief summary of issues raised:	Summary of action taken / how this has been covered
Bristol City Council indicated that they were aware of the potential noise impact of the new chimneys and that they were currently dealing with a planning application for the chimneys. They advised that they would be attaching the following planning condition in respect of noise from the facility: *The Rating Level of any noise from any fixed plant shall not exceed the pre-existing background noise level by more than 5 dB at any time at residential properties and 6dBA at any sensitive industrial use as determined by BS 4142: 1997 Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas.* They went on to state that the existing noise conditions on the 1994 planning permission for the incinerator were	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 Applicant has confirmed that they will undertake a noise assessment prior to operation to provide both baseline and emissions arising from the facility. We have included pre-operational condition PO6 requiring the operator to submit a noise and vibration monitoring plan for the site during both commissioning and operation. Improvement Condition IC7 requires the operator to carry out and report on the monitoring proposed under PO6.

poorly written and did not offer adequate control for noise nuisance to all potential sensitive uses in the area.	

Response Received from Public Health England (PHE)	
Brief summary of issues raised:	Summary of action taken / how this has been covered
Public Health England stated that given the nature of the proposed facility, the following PHE position statement was relevant: *'Modern, well managed incinerators make only a small contribution to local concentrations of air pollutants. It is possible that such small additions could have an impact on health but such effects, if they exist, are likely to be very small and not detectable.'* PHE went on to say that there was no evidence to suggest that the proposed installation could not be operated without increases in adverse health effects in the local population, provided that it complies with the requirements of the statutory environmental permitting process. They also recommended that the Environment Agency took note of the following comments: (1) The site emergency response plan should list quantity and location of waste types, i.e. the applicant states there will be an inventory of raw materials, but this needs to be complimented by an inventory of wastes on site. (2) The applicant has not evaluated potential impacts on air quality during start up, we recommend this scenario is modelled and results compared to short term air quality objectives. (3) The applicant has included an old	We have audited the Applicant's HHRA (Human Health Risk Assessment) as reported in section 5.3. We are satisfied that that the potential emissions of pollutants including dioxins, furans, dioxin like PCB's and metals from the proposed facility are unlikely to have an impact upon human health. We have taken account of the additional comments 1-3 as follows: (1) The Applicant will operate a proprietary waste tracking system, a bar-coded tagging system which enables carts of waste to be scanned and referenced against a consignment note and tracked from source, through their facility, to ultimate disposal. Therefore a current electronic inventory of wastes on site will always be available. (2) The IED Chapter IV emission limit values do not apply during start-up and shutdown periods. During start-up auxiliary fuel is used to bring the

copy of planning permission, dated 18 February 1994 which stipulated a 5 year period to begin the development. Items 12 and 13 from this permission require the applicant to perform air quality monitoring prior to operations commencing. PHE can assist with the interpretation of air quality monitoring results in relation to human health.	furnace up to the required temperature before waste can be introduced. Similarly, auxiliary fuel is used to maintain temperature during shutdown until all waste has been cleared from the grate. However the emission control, abatement and monitoring systems must be in operation during start-up and shutdown periods when waste is being burnt. With the abatement systems in continuous operation during these periods, it is unlikely that there will be any extended periods during start-up/shutdown when emissions will be significantly above the limits set in the permit. Our consideration of impacts from the Installation resulting from periods of abnormal operation is recorded at Section 5.5 of this document. (3) Items 12 and 13 of the planning permission relate to “a scheme for the monitoring of air pollution.” We are satisfied that this is not relevant to our determination of the Applicant’s environmental permit application.

Response Received from Natural England (NE)	
Brief summary of issues raised:	Summary of action taken / how this has been covered
Natural England confirmed that based on the information provided (and applying the joint national NE/EA guidance) they would not expect to have any issues with the proposed development from an air quality point of view, provided that the Environment Agency had itself concluded no Likely Significant Effect (LSE). They questioned whether the Environment Agency has undertaken a Habitats Regulations Assessment.	We have undertaken a Habitats Regulations Assessment. Our Appendix 11 assessment which considered emissions to air from the proposed incinerator and which concluded no LSE on the relevant European sites. A copy of our assessment was sent to Natural England ‘for information only’ in accordance with our permitting guidance.

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

No responses were received.