Permitting decisions

Variation

We have decided to grant the variation for Isle of Wight Waste Recovery Park operated by Amey LG Limited

The variation number is EPR/QP3337AD/V003.

The permit number is EPR/QP3337AD.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document provides a record of the decision making process. It summarises the decision making process in the decision checklist to show how all relevant factors have been taken in to account.

This decision document provides a record of the decision making process. It:

- highlights key issues in the determination
- summarises the decision making process in the decision checklist to show how all relevant factors have been taken into account
- shows how we have considered the consultation responses

Unless the decision document specifies otherwise we have accepted the applicant's proposals.

Read the permitting decisions in conjunction with the environmental permit and the variation notice. The introductory note summarises what the variation covers.

About this variation

The operator (Amey LG Limited) has applied for a variation to their permit in order to change the thermal treatment technology type from gasification plant to a direct burn incinerator plant. The direct burn technology is referred to as a "moved bed incinerator" by the operator, whom characterises this as sharing similar features to that of "moving grate" and "rotary kiln" technology.

The primary design of such moved bed incinerator allows waste to be introduced into an initial combustion chamber on a refractory lined bed (similar to rotary kiln) which is inclined towards the combustion zone. A series of horizontally mounted paddles rotate to assist moving the waste through the incinerator (as an alternative to "moving grate" transportation).

There are no changes to existing permitted waste types or quantities.

How this document is structured

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Glossary of acronyms used in this document

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

AAD	Ambient Air Directive (2008/50/EC)
APC	Air Pollution Control
AQS	Air Quality Strategy
BAT	Best Available Technique(s)
BAT-AEL	BAT Associated Emission Level
BREF	BAT Reference Note
CEM	Continuous emissions monitor
CFD	Computerised fluid dynamics
CHP	Combined heat and power
COMEAP	Committee on the Medical Effects of Air Pollutants
CROW	Countryside and rights of way Act 2000
CV	Calorific value
CW	Clinical waste
CWI	Clinical waste incinerator
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DD	Decision document
EAL	Environmental assessment level
EIAD	Environmental Impact Assessment Directive (85/337/EEC)
ELV	Emission limit value
EMAS	EU Eco Management and Audit Scheme
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2010 (SI 2010 No. 675) as amended
ES	Environmental standard
EWC	European waste catalogue
FSA	Food Standards Agency
GWP	Global Warming Potential
HHRAP	Human Health Risk Assessment Protocol
HPA	Health Protection Agency (now PHE – Public Health England)
HRA	Human Rights Act 1998
HW	Hazardous waste
HWI	Hazardous waste incinerator

IBA	Incinerator Bottom Ash
IED	Industrial Emissions Directive (2010/75/EU)
IPPCD	Integrated Pollution Prevention and Control Directive (2008/1/EC) – now superseded by IED
I-TEF	Toxic Equivalent Factors set out in Annex VI Part 2 of IED
I-TEQ	Toxic Equivalent Quotient calculated using I-TEF
LCPD	Large Combustion Plant Directive (2001/80/EC) – now superseded by IED
LCV	Lower calorific value – also termed net calorific value
LfD	Landfill Directive (1999/31/EC)
LADPH	Local Authority Director(s) of Public Health
LOI	Loss on Ignition
MBT	Mechanical biological treatment
MSW	Municipal Solid Waste
MWI	Municipal waste incinerator
NOx	Oxides of nitrogen (NO plus NO_2 expressed as NO_2)
Opra	Operator Performance Risk Appraisal
PAH	Polycyclic aromatic hydrocarbons
PC	Process Contribution
PCB	Polychlorinated biphenyls
PEC	Predicted Environmental Concentration
PHE	Public Health England
POP(s)	Persistent organic pollutant(s)
PPS	Public participation statement
PR	Public register
PXDD	Poly-halogenated di-benzo-p-dioxins
PXB	Poly-halogenated biphenyls
PXDF	Poly-halogenated di-benzo furans
RDF	Refuse derived fuel
RGS	Regulatory Guidance Series
SAC	Special Area of Conservation
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 issue the variation to the Applicant.

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 31st May 2017. This means we considered it was in the correct form and contained sufficient information for us to begin our determination but not that it necessarily contained all the information we would need to complete that determination.

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

2.2 Consultation on the Application

We carried out consultation on the Application in accordance with the EPR, our statutory PPS and our own internal guidance RGS Note 6 for Determinations involving Sites of High Public Interest. We consider that this process satisfies, and frequently goes beyond the requirements of the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, which are directly incorporated into the IED, which applies to the Installation and the Application. We have also taken into account our obligations under the Local Democracy, Economic Development and Construction Act 2009 (particularly Section 23). This requires us, where we consider it appropriate, to take such steps as we consider appropriate to secure the involvement of representatives of interested persons in the exercise of our functions, by providing them with information, consulting them or involving them in any other way. In this case, our consultation already satisfies the Act's requirements.

We advertised the Application by a notice placed on our website, which contained all the information required by the IED, including telling people where and when they could see a copy of the Application.

We made a copy of the Application and all other documents relevant to our determination (see below) available to view on our Public Register. Anyone wishing to see these documents could do so and arrange for copies to be made.

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

- Director of Public Health / Public Health England
- Food Standards Agency
- Health and Safety Executive
- Local Authority (planning).
- Local Authority (environmental health)
- National Grid
- Sewage Undertaker (southern water)
- Natural England

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

We received consultation responses from the Local Authority (Planning) – Isle of Wight Council, and sewage undertaker (Southern Water).

2.3 Requests for Further Information

Although we were able to consider the Application duly made, we did in fact need more information in order to determine it, and issued an information notice on 16th June 2017. A copy of the information notice was placed on our public register.

In addition to our information notices, we received additional information during the determination:-

- email confirming reporting reference conditions (incineration)
- AQIA Forest Road EP Variation rev3
- Confirmation that the CEMs monitoring will include Ammonia and N2O monitoring

We made a copy of this information available to the public in the same way as the responses to our information notice.

3 The legal framework

The Variation will be issued, under Regulation 20 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

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

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

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

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

4 The Installation

4.1 Description of the Installation and related issues

4.1.1 The permitted activities

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

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

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

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

Many activities which would normally be categorised as “directly associated activities” for EPR purposes (see below), such as air pollution control plant (including storage and preparation of treatment chemicals), and the ash storage bunker, are not listed as directly associated activities within this permit because they are included/covered within the scope of the main listed activity description.

Other activities not covered by the scope of the main listed activity are included within the permit as “directly associated activities”. At this Installation, these DAAs include ‘the generation of electricity (using a steam turbine and a backup electricity generator for emergencies)’, and ‘the management of uncontaminated surface waters’.

Waste operations are also listed within table S1.1 of the permit. These are not subject to change by result of this variation.

The listed activities and DAAs comprise one installation, and together with waste operations (whose main purpose is to recover recyclables rather than dispose of them) comprise a regulated facility. The permit covers the full extent of the regulated facility.

4.1.2 The Site

The Installation is located near Newport in the Isle of Wight at national grid reference SZ 47099 89700. Parkhurst Forest is situated on the boundary for the site.

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

Further information on the site is addressed below at 4.3.

4.1.3 What the Installation does

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

Notwithstanding the fact that energy will be recovered from the process; the process is never the less ‘incineration’ because it is considered that its main purpose is the thermal treatment of waste.

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

Waste throughput, Tonnes/line	44,000 tonnes/annum permitted.	5,000 kg/hour (Operational throughput = 39,000 based on 5,000 x 7,800hrs)
Number of line(s)	1 line	
Maximum operating hours	7,800 hrs per annum	
Waste processed	RDF (Refuse Derived Fuel)	
Furnace technology	Moved Bed *(utilising a fixed refractory lined bed, with a series of lateral shafts holding paddles above the bed / waste mass – with the paddles rotating independently in order to facilitate waste transportation).*	
Auxiliary Fuel	Gas Oil [Light Fuel Oil]	
Acid gas abatement	Dry	Hydrated Lime
NOx abatement	SNCR	Urea
Reagent consumption	Auxiliary Fuel 100 t/annum Urea : 273 m^3 Lime : 1,443 t/annum Activated carbon: 11.7 t/annum	
Flue gas recirculation	No	
Dioxin abatement	Activated carbon	

Particulate removal	Ceramic Filter	
Stack	Grid Reference SZ 47102 89701	
	Height, 26 m	Diameter 1.0 m
Flue gas	Actual Flow, 14.90 Nm^3/s	Actual Velocity, 18.98 m/s
	Temperature °C	140
Electricity exported	23,000 MWh (net annual electricity for export to National Grid	26,600 MWh (generated)
Steam conditions	Operational Temperature, 400 °C	Operational Pressure, 45 bar
Steam exported	n/a	
Waste heat use	Waste heat from the incineration process is used to pre-heat combustion air (by use of a gas-air heat exchanger - after the boiler).	

4.1.4 Key issues of the decision (refer to EfW checklist)

Key change requested by this application relates to a change in thermal treatment technology type from that of 'gasification' to 'direct burn incineration' by use of a "moved bed incinerator". The key issues therefore include the assessment of impacts from emissions (on people and ecological receptors) and the assessment of Best Available Techniques and we therefore describe how we determined these issues in most detail in this document.

4.2 The site and its protection

This variation introduces a subsurface water tank (capturing boiler blowdown water and effluent from the demineralisation unit) for off-site transfer to a suitably permitted treatment site. The variation also introduces additional storage for Urea for use within the SNCR abatement system. There are no other changes to the site report.

Boiler blowdown / demineralisation storage – prior to removal offsite

A single pass system for boiler water will be employed within the Installation (with a proportion of boiler water being reused within the facility – where possible). The reason for this is because the Isle of Wight experiences a high level of water hardness, for which the technology provider (Michaelis) cannot provide guarantees that the equipment will not cause excessive wear / damage to the demineralisation plant / boiler. High purity feed water is required to ensure proper operation of steam generation / energy production.

We are requiring the operator to re-examine this position (including the use of additional treatment methods) by improvement condition, as this will allow operational data to be used within such assessment.

Until this time, the operator will operate a single pass water system, for which a subsurface tank will be employed to collect such water effluent - prior to removal offsite. Boiler effluent is expected to be generated at a rate of 200 l/hr (0.2 m^3/hr). The tank will hold a volume of 21m^3 –which is just under the volume for a typical road tanker (of 25m^3) which would be employed to empty such tank every 2-3 days. (The tank will have sufficient capacity for 105 hours / 4 days operation).

The tank will be designed and constructed in line with CIRIA 736 standards - comprising a double skinned GRP (Glass Reinforced Plastic) tank, of which the air gap within the skins will include a leak detection system which will be linked to the installation control office to identify if the skins have been breached – i.e. leaks).

The tank will be equipped with a high level alarm, to minimise the risk of overfilling, linked to the installation control office. The alarm will be set at 90% capacity, to give time to arrange for a tanker to reduce the tank contents. The site will also have access to a submersible pump, (normally used for emptying of bunds at other permitted sites on the IoW) which may be used to transfer contents from the tank to IBC's in the unlikely event that no tanker is immediately available to empty the tank.

The applicant confirmed that the proposed tank has not been sourced at the time of providing information, and therefore we have include a pre-operational condition which will require the operator to confirm that the above measures are being employed prior to commencing operation.

Urea

A urea storage tank will be located internal to the thermal treatment building. The tank will hold a maximum quantity of 20 tonnes (with a maximum usage quantity of 273 m^3 per annum). As the tank is located internal to the building, we are satisfied that no additional measures are required in relation to site condition.

Further information is detailed in section 4.3.4 (accident management).

We are satisfied that the above measures will maintain protection of the site following the changes made by this variation. Existing site protection conditions will remain present within the permit.

4.3 Operation of the Installation

4.3.1 Administrative issues

There are no changes to the operator / ability of the operator as a result of this application for variation.

4.3.2 Environmental Management

There are no changes to the permitted requirements for Environmental Management System as a result of this variation.

4.3.3 Site Security

There are no changes to the permitted requirements for site security as a result of this variation.

4.3.4 Accident Management

The existing permit requires (condition 1.1.1) operation in accordance with a written management system (which covers accidents). We are not changing this condition and the requirement will be maintained following this variation.

The operator has not provided an updated accident management plan as part of the application, but has carried out risk assessments (including accidents) as part of the Environmental Risk Assessment that was submitted with the application.

The accident risk assessment remains largely unchanged from that of the existing permit. The main change upon the accident management plan (by this variation) relates to the change in incineration technology, and employment of SNCR (by injection of urea solution into flue gases) in order to control NOx emissions.

The incineration plant will be equipped with necessary process and performance monitoring systems. This is a requirement which is being retained through the existing permit.

A urea storage tank will be located internal to the thermal treatment building. The tank will hold a maximum quantity of 20 tonnes (with a maximum usage quantity of 273 m^3 per annum).

In addition to urea storage being internal to the incineration building, the applicant has also confirmed the following measures are in place:-

- All oils, fuels and chemicals will be stored in fully bunded tanks
- All oils, fuels and chemicals tanks to be located away from transport movements (or provided with additional protection where location cannot be changed).
- Drainage of all site surface water via attenuation tank (25m^3) and oil interceptor, with penstock valve for isolation where required.
- Inspection regime for tanks, bunds and pipework.
- Staff training and awareness, together with procedures for material deliveries and spill response.
- Spill kits located within key areas.
- Hardstanding, and kerbing around storage locations.

An Accident Management Plan will form part of the Environmental Management System and must be in place prior to commissioning. We are requiring the operator to update their existing accident management plan and provide confirmation by pre-operational condition within the permit.

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 approved Fire Prevention Plan is incorporated into the existing permits. There are no changes to this as part of this variation. The plan has been approved and is incorporated within operating techniques table S1.2. We are satisfied that appropriate measures will be in place to prevent fires and to minimise the impact from a fire if it was to occur.

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**
Application	Application documents: Section II – summary of proposed changes Section III – Supporting information	Requirement from existing permit
Response to Schedule 5 Notice dated 03/03/16	The response to questions 6 and 7 Odour management plan	
Response to schedule 5 notice dated 06/04/16	Fire prevention plan	
Application for variation EPR/QP3337AD/V003	Variation application documents : change technology from Gasification to Moved Bed Incinerator (direct burn incineration)	Details of change in listed activity, capacity, waste feed, start-up and shutdown, monitoring, incineration parameters, energy recovery, water emissions and disposal, BAT justification, flow rates and other key aspects relating to operating techniques.
Response to Schedule 5 Notice dated 16/06/17	All – part 1:	
	All – part 2:	
Additional Information	Email confirming reporting reference conditions (incineration)	
	AQIA Forest Road EP Variation rev3	
	Confirmation that the CEMs monitoring will include Ammonia and N_2O monitoring	

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

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

We are satisfied that the Applicant can accept the wastes contained in Table S2.2, S2.3 and S2.4 of the Permit. The operator has not requested any changes to waste types by this application for variation.

There are no changes to the operational capacity of the Installation – which is limited within this existing permit to 80,000 tonnes per year. This is based upon the following conditions:

- 47,400 tonnes per year for mechanical treatment.
- 44,000 tonnes per year of waste for incineration after treatment.
- 2000 tonnes per year for storage prior to transfer off-site.

The operator confirmed (by email dated 13/11/2017) that stated waste thresholds (within the existing permit) remain appropriate. These are calculated on the basis of the annual throughput of MSW at the plant being 47400 tpa, which is equivalent to approx. 152 tonnes per day, assuming 6 days collection. Therefore,

assuming the maintenance period is two weeks, this is equivalent to approximately 2000 tonnes of transferred waste, allowing for slightly higher than average arising's. We have therefore not made any changes to thresholds by this variation.

The subject of this variation relates to the incineration plant which is permitted to incinerate (44,000 tonnes per year – currently permitted by gasification technique). The variation is to change the gasification technique to a moved bed waste incinerator operating at the same annual throughput based upon an hourly throughput of 5 tonnes per hour based on 7,800 operational hours per annum: We are satisfied that the current operational capacities remain appropriate by this variation.

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.

Consideration of the thermal input of the Installation at approximately 16.25MWth excludes the application from requiring a cost-benefit assessment to "assess the cost and benefits of providing for the operation of the installation as a high-efficiency cogeneration installation" because the total thermal input is below the 20 MW threshold stated within Article 14(5) of the Energy Efficiency Directive.

The application states that thermal input is based upon the incineration of RDF (with a CV of 11.7MJ/kg) with a density of 250-350 kg/m^3 and throughput of 5 tonnes per hour. *The technology provider Michaelis state that the nominal boiler heat transfer capacity is 13.5 MW.*

The Installation is classified as an "incinerator" (rather than co-incinerator) as the primary purpose of plant is a waste disposal activity. The application does not include application for R1 status.

(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:

- The plant will produce electrical energy (by the thermal treatment process) consuming a proportion of this within the Installation in order to operate the thermal treatment plant and waste processing operations. Ways in which electrical energy is re-used include:-
    - the operation of equipment used to process wastes into a RDF and to separate recyclates,
    - lighting (as there will be minimal opportunity to use natural light as the plant is fully enclosed).
    - ventilation and dust control, and
    - computerised management system will also consume energy whilst recording energy use.
- The plant will produce heat energy (by the thermal treatment process), of which a proportion will be used within the Installation. Here combustion air is pre-heated using a gas-air heat exchanger (after the boiler). This achieves the following benefits:-
    - Faster drying of the wastes and degassing in the initial stages

- Better air mixing in the combustion chamber (due to temperature)
- Higher energy efficiency, with flue gases leaving the system at 140°C;

- An energy statement was prepared for the site and was presented as part of the previous application.

The Application states that the specific energy consumption, a measure of total energy consumed per unit of waste processed, will be 102 kWh/tonne. The installation capacity (incineration) is 44,000 t/a.

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

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

Considering the data provided within the application and further information, the specific energy consumption for this Installation appears better than the range specified (up to 150,000 t.p.a) and therefore we consider that this Novel Technology is BAT for energy usage.

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

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

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

The term CHP in this context represents a plant which also provides a supply of heat (in addition to electricity) from the electrical power generation process either via a district heating network or directly to an industrial / commercial building or process. It is recognised however that opportunities (in the form of outlets to receive such heat energy) 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) for raw waste inputs. The Application states that energy recovery will be around 0.65MWh/ /tonne based upon the capacity (incineration) of 44,000 t/a. 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 of waste per annum (which equates a range of 0.4 – 0.72 MWh/tonne of waste).

The Installation will generate electricity only and has been specified to maximise electrical output with little or no use of waste heat. The Application shows *3.68MWe* of electricity produced for an annual burn of 44,000 tonnes – which equates to 8.4 MW / 100 kt of waste of which *2.28MWe* is the estimated net export (meaning that around 1.4MWe is used within the Installation within incineration and mechanical treatment activities).

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.

At present, no suitable heat outlets have been identified on the island (to enable the thermal treatment plant to operate as a CHP plant). The site is geographically isolated and has a low steam output due to the size of the plant. The turbine will be equipped with a steam bleed to enable offtake of steam in the event a suitable heat outlet is identified in the future. The operator is committed to reviewing this position throughout the life of the project, and this will be assessed against condition 1.2.3 of the permit which requires regular review of this position.

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 has previously provided an energy statement for the site (for the previous permit determination) and the status of this has not changed.

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

(iv) R1 Calculation

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.

Electrical output from the plant is limited by the national grid connections between the Isle of Wight and mainland, and should this be upgraded, the plant electrical efficiency may be improved. As with the previous proposals, no claim for R1 status is made for this permit and as a result, the plant is classified as a D10 disposal facility.

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

(v) Choice of Steam Turbine

The proposed steam conditions are 400^{o}C and 45 Bar. (This is the highest temperature recommended in order to avoid corrosion issues). The efficiency of the boiler (for pre-treated municipal waste) is 88.1% considering energy in waste of 18.4 MWh and energy in steam of 16.2 MWh.

(vi) Choice of Cooling System

The plant will be equipped with air cooled condensers (ACC) for the release of excess heat.

The two main alternatives to an ACC are a water cooled condenser (WCC) or an evaporative condenser (EC). All are considered in Sector Guidance Note EPR 5.01 as potential BAT options. The WCC uses a recirculating water supply to condense the steam and the EC uses water which is evaporated directly from the condenser surface and lost to the atmosphere to provide the required cooling.

The main advantage of both of these water based systems is that they provide improved cooling and are not susceptible to condenser efficiency fluctuation with changing air temperature. Air cooled condensers operating in high summer air temperatures can result in insufficient condensing power and subsequently reduce the efficiency of the generating turbine. Water cooled condensing system generate less noise in comparison to the noise generated by the fans in an air cooled condenser system.

However, water cooled condensers require significant volumes of make-up water. The absence of a local river of sufficient size would require the use of main town water supply. Chemical additives are also required. Waste water is generated which requires disposal. In addition, during winter months there is a risk of freezing and maintenance costs are high due to the wet nature of the technology. Evaporative condensers have significant potential for the release of water vapour plumes.

The operator has chosen to employ an air cooled condenser in order to avoid additional water consumption for steam condensing (and additional disposal requirements). The operator has selected a technology which incorporates an efficient blower system in order to reduce both power consumption and noise emissions.

We agree that the use of air cooled condensers represent BAT for Isle of Wight Waste Recovery Park.

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

Compliance with Article 14(5) of the Energy Efficiency Directive is not a relevant consideration because the installation's total net thermal input is 16.25 MWth which is below the threshold specified in the directive.

(viii) Permit conditions concerning energy efficiency

Conditions 1.2.2 and 1.2.3 will remain within 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. The following parameters are required to be reported: total electrical energy generated; electrical energy exported; total energy usage and energy exported as heat (if any). Together with the total MSW burned per year, this will enable the Environment Agency to monitor energy recovery efficiency at the Installation and take action if at any stage the energy recovery efficiency is less than proposed.

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

4.3.8 Efficient use of raw materials

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

The Operator is required to report with respect to raw material usage under condition 4.2 and Schedule 4, including consumption of lime, activated carbon and urea used per tonne of waste burned. This will enable the Environment Agency to assess whether there have been any changes in the efficiency of the air pollution control plant, and the operation of the SNCR to abate NO_x. These are the most significant raw materials that will be used at the Installation, other than the waste feed itself (addressed elsewhere). The efficiency of the use of auxiliary fuel will be tracked separately as part of the energy reporting requirement under condition 4.2.1. Optimising reagent dosage for air abatement systems and minimising the use of auxiliary fuels is further considered in the section on BAT.

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

This requirement addresses wastes produced at the Installation and does not apply to the waste being treated there. The principal waste streams the Installation will produce are bottom ash, APC (Air Pollution Control) residues and recovered metals.

The first objective is to avoid producing waste at all. Waste production will be avoided by achieving a high degree of burnout of the ash in the furnace, which results in a material that is both reduced in volume and in chemical reactivity. Condition 3.1.3 and associated Table S3.5 specify limits for loss on ignition (LOI) of <5%. Compliance with this limit will demonstrate that good combustion control and waste burnout is being achieved in the furnaces and waste generation is being avoided where practicable.

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

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

In order to ensure that the IBA and APC residues are adequately characterised, we have included a pre-operational condition requiring the Operator to provide a written plan for approval detailing the ash sampling protocols. Table S3.5 requires the Operator to carry out an ongoing programme of monitoring.

The Application states that the containerised bottom ash will be periodically removed by licensed waste carriers either for disposal in a landfill or recycled where appropriate.

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

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

5. Minimising the Installation's environmental impact

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

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

As this application involves a variation to an existing permit (whereby the operator has stated no required changes to existing emission limit values) - we are required to check these impacts as a result of this technology change – which will ultimately include changes to emission flow rates, which are directly linked to Air Dispersion modelling results / impact assessments.

In addition to this, we also checked emission limits to ensure that these remain within the scope of any legislative requirements.

	Parameter		**EPR-JP3132LH-A001**	**EPR-QP3337AD-V002**	**EPR-QP3337AD-V002 -This variation-**
A5	Particulate matter	½-hr average	30 mg/m^3	30 mg/m^3	30 mg/m^3
		daily average	10 mg/m^3	10 mg/m^3	10 mg/m^3
	Total Organic Carbon (TOC)	½-hr average	20 mg/m^3	20 mg/m^3	20 mg/m^3
		daily average	10 mg/m^3	10 mg/m^3	10 mg/m^3
	Hydrogen chloride	½-hr average	60 mg/m^3	60 mg/m^3	60 mg/m^3
		daily average	20 mg/m^3	-	10 mg/m^3
	Hydrogen fluoride	periodic over minimum 1-hour period	4 mg/m^3	2 mg/m^3	2 mg/m^3
	Carbon monoxide	95% of all 10-minute averages in any 24-hour period	150 mg/m^3	100 mg/m^3 [½-hr average] Note 1	150 mg/m^3
		daily average	50 mg/m^3	50 mg/m^3	50 mg/m^3
	Sulphur dioxide	½-hr average	200 mg/m^3	200 mg/m^3	200 mg/m^3
		daily average	50 mg/m^3	50 mg/m^3	50 mg/m^3
	Oxides of nitrogen (NO and NO_2 expressed as NO_2)	½-hr average	400 mg/m^3	400 mg/m^3	400 mg/m^3
		daily average	200 mg/m^3	200 mg/m^3	200 mg/m^3
	Cadmium & thallium and their compounds (total)	periodic over minimum 30 minute, maximum 8 hour period	0.05 mg/m^3	0.05 mg/m^3	0.05 mg/m^3
	Mercury and its compounds		0.05 mg/m^3	0.05 mg/m^3	0.05 mg/m^3
	Sb, As, Pb, Cr, Co, Cu, Mn, Ni & V (& their compounds (total)		0.5 mg/m^3	0.5 mg/m^3	0.5 mg/m^3

	Dioxins / furans (I-TEQ)	periodic over minimum 6 hours, maximum 8 hour period	0.1 ng/m^3	0.1 ng/m^3	0.1 ng/m^3
	Ammonia (NH_3)	daily average	-	-	20 mg/m^3

Note 1 IED gives the option for either a) 100 mg/m^3 as ½ average or b) 150 mg/m^3 as 95%-ile of 10 min averages.

5.1 Assessment Methodology

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

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

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

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

5.1.2 Use of Air Dispersion Modelling

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

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

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

AAD target values, AQS objectives and EALs do not have the same legal status as AAD limit values, and there is no explicit requirement to impose stricter conditions than BAT in order to

comply with them. However, they are a standard for harm and any significant contribution to a breach is likely to be unacceptable.

PCs are considered **Insignificant** if:

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

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

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

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

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

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

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

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

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

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

5.2 Assessment of Impact on Air Quality

The Applicant's assessment of the impact of air quality was provided as part of the Application. The assessment comprises:

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

We required additional information for Air Dispersion Modelling, as emissions of Ammonia had not been included within the report. An updated Air Dispersion Modelling report was provided in response to Schedule 5 Notice – received on 7th July 2017.

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

The Applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on local air quality from the Installation's stack emissions using the ADMS 5.1 dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model used 5 years of meteorological data collected from the weather station at St. Catherine's Point (Isle of Wight) covering 2010, 2011, 2012, 2013, and 2014. The impact of the terrain surrounding the site upon plume dispersion was considered in the dispersion modelling.

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

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

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

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

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

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

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

5.2.1 Assessment of Air Dispersion Modelling Outputs

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

As part of this variation request (EPR-QP3337AD-V003) the operator requested emission limit values reported at 6% oxygen, which correspond to "co-incineration" ELVs / reference conditions. This Installation is classed as an "incinerator" for which relevant oxygen reference conditions are reported at 11%. We highlighted this issue to the applicant whom confirmed by reply email (dated 9th August 2017) that incineration ELVs (and reference conditions) would be appropriate.

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

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

Pollutant	**EQS / EAL**		**Back-ground**	**Process Contribution (PC)**		**Predicted Environmental Concentration (PEC)**	
	µg/m³		**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
NO_2	40	1	8.7	1.62	4.05	10.3	25.8
	200	2	17.4	42.61	21.3	60.01	30.0
PM_{10}	40	1	13.9	0.12	0.30		
	50	3	27.7	0.41	0.82		
$PM_{2.5}$	25	1	9.7	0.12	0.48		
SO_2	266	4	13.4	65.29	24.5	78.69	29.6
	350	5	13.4	60.67	17.3	74.07	21.2
	125	6	13.4	3.69	3.0		
HCl	750	7	0.4	37.62	5.02		
HF	16	8	0.5	0.01	0.06		
	160	7	1	2.51	1.57		
CO	10000	9	206.2	47.03	0.47		
	30000	10	206.2	94.05	0.31		
VOC (Benzene)	5	1	0.8	0.12	2.40	0.92	18.4
PAH (ng/m³)	0.25	1	0.00004	0.00002	0.01		
NH_3	180	1	1.9	0.1	0.06		
	2500	10	3.8	5.52	0.22		
PCBs	0.2	1		0.00006	0.03		
Dioxins			17.6	0.000000 00659		17.6	

PAH as benzo[a]pyrene

1 Annual Mean
2 99.79th %ile of 1-hour means
3 90.41st %ile of 24-hour means
4 99.9th ile of 15-min means
5 99.73rd %ile of 1-hour means
6 99.18th %ile of 24-hour means
7 1-hour average
8 Monthly average
9 Maximum daily running 8-hour mean
10 1-hour maximum

Pollutant	EQS / EAL		Back-ground	Process Contribution		Predicted Environmental Concentration (PEC)	
	µg/m³		µg/m³	µg/m³	% of EAL	µg/m³	% of EAL
Cd & Tl	0.005	1	0.00007	0.0002	4.0	0.00027	5.4
Hg	0.25	1	0.001	0.0004	0.16		
	7.5	2	0.002	0.02	0.27		
Sb	5	1	0.0002	0.0004	0.01		
	150	2	0.0005	0.02	0.01		
Pb	0.25	1	0.003	0.0004	0.16		
Co	0.2	1	0.00003	0.0004	0.20		
Cu	10	1	0.002	0.0004	0.00		
	200	2	0.005	0.02	0.01		
Mn	0.15	1	0.002	0.0004	0.27		
	1500	2	0.004	0.02	0.00		
V	5	1	0.0005	0.0004	0.01		
	1	3	0.001	0.01	1.00		
As	0.003	1	0.0005	0.0004	13.33	0.00090	30.0
Cr (II)(III)	5	1	0.001	0.0004	0.01		
	150	2	0.003	0.02	0.01		
Cr (VI) **	0.0002	1	0.00010	0.0000012	0.60		
Ni	0.02	1	0.0008	0.0004	2.00	0.00120	6.0

1 Annual Mean
2 1-hr Maximum
3 24-hr Maximum
** *Chromium (VI) derived from air pollution control residues from 18 municipal waste incinerators and waste wood co-incinerators in the UK. The data ranges from a minimum of 2.3 x 10-6 mg/Nm3 to a maximum of 1.3 x 10-4 mg/Nm3, with an average of 3.5 x 10-6 mg/Nm3. The maximum value of 1.3 x 10-4 mg/Nm3 was used in this study to represent the emissions of chromium (VI) for assessment against the relevant EQS.*

The applicant has calculated the above metals data assuming that each metal will be released at one-ninth of the aggregate metals emission concentration limit.

The Industrial Emissions Directive (IED) has a mandatory Emission Limit Value (ELV) of 0.5mg/m³ aggregated for nine Group 3 metals (antimony, arsenic, chromium, cobalt, copper, lead, manganese, nickel, vanadium and their components). To assess these emissions, we undertake a two stage assessment:-

(a) Assume each metal comprises 100% of this limit (conservative approach).

(b) Carry out a more detailed assessment (where results from stage 1 show that a theoretical exceedances to an environmental standard could exist). .

We have therefore taken the applicants assessment and converted the assessment to the group 3 metal ELV (0.5 mg/m³) – see section 5.2.3 of this document for further assessment :-

Pollutant – each metals at ELV (0.5 mg/m³)	EQS / EAL		Back-ground	Process Contribution		Predicted Environmental Concentration (PEC)	
	µg/m³		µg/m³	µg/m³	% of EAL	µg/m³	% of EAL
Hg	0.25 7.5	1 2	0.001 0.002	0.0036 0.18	1.44 2.4	0.0046	1.8
Sb	5 150	1 2	0.0002 0.0005	0.0036 0.18	0.072 0.12		
Pb	0.25	1	0.003	0.0036	1.44	0.0066	2.6
Co	0.2	1	0.00003	0.0036	1.8	0.00363	1.8
Cu	10 200	1 2	0.002 0.005	0.0036 0.18	0.036 0.09		
Mn	0.15 1500	1 2	0.002 0.004	0.0036 0.18	2.4 0.012	0.0056	3.7
V	5 1	1 3	0.0005 0.001	0.0036 0.09	0.072 9		
As	0.003	1	0.0005	0.0036	120	0.0041	136.7
Cr (II)(III)	5 150	1 2	0.001 0.003	0.0036 0.18	0.072 0.12		
Cr (VI) **	0.0002	1	0.00010	0.0000108	5.4	0.0001	55.4
Ni	0.02	1	0.0008	0.0036	18	0.0044	22

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

Screening out emissions

For group 3 metals (antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium and their compounds) our screening considers the worst case scenario of emission at group 3 metal ELV (0.5 mg/m³).

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

1	PM_{10}	1	Annual Mean
		3	90.41st %ile of 24-hour means
2	$PM_{2.5}$	1	Annual Mean
3	SO_2	6	99.18th %ile of 24-hour means
4	HCL	7	1-hour average
5	HF	8	Monthly average
		7	1-hour average
6	CO	9	Maximum daily running 8-hour mean
		10	1-hour maximum
7	PAH	1	Annual Mean
8	NH_3	1	Annual Mean
		10	1-hour maximum
9	PCB's	1	Annual Mean

10	Hg	2	1-hr Maximum
11	Sb	1	Annual Mean
		2	1-hr Maximum
12	Cu	1	Annual Mean
		2	1-hr Maximum
13	Mn	2	1-hr Maximum
14	V	1	Annual Mean
		3	90.41st %ile of 24-hour means
15	Cr (II)(III)	1	Annual Mean
		2	1-hr Maximum

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

(ii) Emissions unlikely to give rise to significant pollution

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

1	NO_2	1	Annual Mean
		2	99.79th %ile of 1-hour means
2	SO_2	4	99.9th ile of 15-min means
		5	99.73rd %ile of 1-hour means
3	VOC (benzene)	5	99.73rd %ile of 1-hour means
4	Cd & Tl	1	Annual Mean
5	Hg	1	Annual Mean
6	Pb	1	Annual Mean
7	Co	1	Annual Mean
8	Mn	1	Annual Mean
9	Cr (VI) **	1	Annual Mean
10	Ni	1	Annual Mean

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.

No EQS/EAL is available for Dioxins. Assessment of these emissions is covered within sections 5.2.2 and 5.3 of this document.

(iii) Emissions requiring further assessment

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

1	As	1	Annual Mean

The above impact has been predicted from an emission concentration for As at the Group III ELV of 0.5 mg/m^3.

Section 5.2.3 considers this metal in more detail.

5.2.2 Consideration of key pollutants

(i) Nitrogen dioxide (NO_2)

The impact on air quality from NO_2 emissions has been assessed against the ES of 40 µg/m3 as a long term annual average and a short term hourly average of 200 µg/m^3. The model assumes a 70% NOX 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 maximum long term PC at a receptor is greater than 1% of the ES and therefore cannot be screened out as insignificant. Whilst this emission cannot be screened as insignificant, it is not expected to result in the ES being exceeded.

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

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

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

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

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

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

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

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

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

(iii) Acid gases, SO_2, HCl and HF

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

the monthly EAL and so the emission screens out as insignificant with the monthly ES interpreted as representing a long term ES.

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

For SO_2, the 99.18th %ile of 24-hour means is screened out as insignificant, however both 99.9th ile of 15-min means and 99.73rd %ile of 1-hour means cannot be screened out as insignificant, the Applicant's modelling shows that the installation is unlikely to result in a breach of the ES. The Applicant is required to prevent, minimise and control SO_2 emissions using BAT, this is considered further in Section 6. We are satisfied that SO_2 emissions will not result in significant pollution.

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

The above tables show that for CO, PAHs, PCBs and NH_3 emissions, the peak long term PC is less than 1% of the ES and the peak short term PC is less than 10% of the ES and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

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

The Applicant has used the ES for benzene for their assessment of the impact of VOC. This is based on benzene being considered to have a stringent ES of organic species likely to be present in VOC (other than PAH, PCBs, dioxins and furans) and therefore considered a conservative approach.

The applicant has not modelled short term emissions for PCBs - stating that data is not available. The PCB short term assessment has previously been carried out (when the application was determined) based on emission data derived from the Waste Incineration Directive (now Annex VI of IED).

We are satisfied that as a result of no changes to waste types and quantities by this variation, (for which the plant is of similar scale) that short term impacts of PCBs will very similar to the previous assessment, for which impacts were deemed acceptable. Ongoing monitoring requirements will remain within the permit to monitor such emissions.

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

NH_3 (Ammonia) emissions are introduced to the emission profile from the site by the operation of an SNCR abatement system which utilises urea solution to abate NOx. The applicant has provided the following data on the impacts from ammonia.

ES			Background Concentration	PC	PC/ES %	PEC	PEC/ES %
	Annual mean	Max hourly mean					
NH_3	180		1.9	0.1	0.06	1.99	1.1%
		2500	3.8	5.52	0.22	9.30	0.37%

The ammonia emission predicted above is based upon a long term release concentration of 8.8 mg/m^3 at 11% oxygen (relevant reference condition for incineration plant). We are satisfied that this level of emission is consistent with the operation of a well-controlled SNCR NO_x abatement system.

Section 5.4.4 considers the impacts from ammonia emissions at relevant habitats sites *(including examination against ecological EQS standards for ammonia rather than human health standards as above).*

The above tables show that for VOC emissions, the peak long term PC is greater than 1% of the ES and therefore cannot be screened out as insignificant. Even so, from the table above, the emission is not expected to result in the ES being exceeded. The Applicant is required to prevent, minimise and control VOC emissions using BAT, this is considered further in Section 6. We are satisfied that VOC emissions will not result in significant pollution.

(V) Summary

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

5.2.3 Assessment of Emission of Metals

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

Annex VI of IED sets three limits for metal emissions:

- An emission limit value of 0.05 mg/m^3 for mercury and its compounds (formerly WID group 1 metals).
- An aggregate emission limit value of 0.05 mg/m^3 for cadmium and thallium and their compounds (formerly WID group 2 metals).
- An aggregate emission limit of 0.5 mg/m^3 for antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium and their compounds (formerly WID group 3 metals).

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

As previously detailed, the operator undertook their assessment on the basis that each of the 9 metals (Group III metals) would emit at 1/9th of the aggregate emission limit of 0.5 mg/m^3. We calculated emissions – each operating at the aggregate emission limit of 0.5 mg/m^3.

Based upon our assessment, the following emissions of metals were screened out as insignificant:-

1	Hg	2	1-hr Maximum
2	Sb	1	Annual Mean
		2	1-hr Maximum
3	Cu	1	Annual Mean
		2	1-hr Maximum
4	Mn	2	1-hr Maximum
5	V	1	Annual Mean
		3	90.41st %ile of 24-hour means
6	Cr (II)(III)	1	Annual Mean
		2	1-hr Maximum

Based upon our assessment, the following emissions of metals whilst not screened out as insignificant were assessed as being unlikely to give rise to significant pollution:

5	Hg	1	Annual Mean
6	Pb	1	Annual Mean
7	Co	1	Annual Mean
8	Mn	1	Annual Mean
9	Cr (VI) **	1	Annual Mean
10	Ni	1	Annual Mean

This left emissions of As requiring further assessment.

In addition to this parameter, we have also undertaken further assessment of Cr(VI) because the data supplied by the applicant (as stated below) is based upon Chromium (VI) derived from air pollution control residues from 18 municipal waste incinerators and waste wood co-incinerators in the UK.

> "Chromium is normally found in different forms (known as "oxidation states"), referred to as chromium (II), chromium (III), and chromium (VI). Chromium (VI) is the most potentially toxic form. The Environment Agency guidance provides information on the emission concentration of chromium (VI) derived from air pollution control residues from 18 municipal waste incinerators and waste wood co-incinerators in the UK. The data range from a minimum of 2.3×10^{-6} mg/Nm^3 to a maximum of 1.3×10^{-4} mg/Nm^3, with an average of 3.5×10^{-6} mg/Nm^3. The maximum value of 1.3×10^{-4} mg/Nm^3 was used in this study to represent the emissions of chromium (VI) for assessment against the relevant EQS."

Whilst this assessment might be acceptable to the Environment Agency (as outlined below), it is not the first stage in assessing these emissions. The first stage is to assume the worst case scenario:-

Where Annex VI of the IED sets an aggregate limit, the worst case assessment assumes that each metal is emitted individually at the relevant aggregate emission limit value (except for Cd where it was assumed to be half of the group ELV for Cd and Tl).

This is a something which can never actually occur in practice as it would inevitably result in a breach of the limit, and so represents a very much worst case scenario.

Following the above stage (assessing worst case scenario) the next steps in assessing such emissions are to consider representative emissions data from other municipal waste incinerators using our guidance note "Guidance to Applicants on Impact Assessment for Group 3 Metals Stack Releases – version 4". *This is the aspect that the operator has assessed without undertaking the initial assessment.* In this case, this is relevant for metals As and Cr (VI)

Results from assessing representative emissions (based on operational data from other incinerators)

Pollutant	**EQS / EAL**		**Back-ground**	**Process Contribution**		**Predicted Environmental Concentration (PEC)**	
	µg/m^3		**µg/m^3**	**µg/m^3**	**% of EAL**	**µg/m^3**	**% of EAL**
As	0.003	1	0.0005	0.0004	13.33	0.00090	30.0
Cr (VI)	0.0002	1	0.00010	0.0000012	0.60		

The application provides the following detail in relation to As metals:-

The thermal treatment technology provider Michaelis has stated that the typical operating emissions for a modern thermal treatment facility are less than those stated in IED, and that for those substances:-

- emissions of arsenic are typically less than 0.2% of the emission limit for the group of nine metals;

The above assessment (of representative emissions) shows that Cr (VI) is screened out as "insignificant", and As assessed as being unlikely to give rise to significant pollution.

This assessment (of representative emissions) along within the guidance listed above (and evidence other incinerators / justification in the application) allows us to agree with the applicants conclusions. The installation has been assessed as meeting BAT for control of metal emissions to air. See section 6 of this document.

We have included an improvement condition which will require the operator to verify these impacts (with a stipulation to monitor metals of Cd(VI) and As) and use monitoring data obtained during the first year of operation to verify predicted concentrations. This is a condition which has been amended (in light of the above) from the original permit.

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. The gathering of evidence is a continuing process. Although gathering evidence is not our role we keep the available evidence under review. The following is a summary of some of the publications which we have considered (in no particular order).

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

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

HPA (now PHE) in 2009 states that "The Health Protection Agency has reviewed research undertaken to examine the suggested links between emissions from municipal waste incinerators and effects on health. While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable". In January 2012 PHE confirmed they would be undertaking a study to look for evidence of any link between municipal waste incinerators and health outcomes including low birth weight, still births and infant deaths. Their current position that modern, well run municipal waste incinerators are not a significant risk to public health remains valid. The study will extend the evidence base and provide the public with further information

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

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

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

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

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

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

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

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

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

v) Consultations

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

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

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

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

The applicant previously undertook a human health risk assessment in 2005, which was accepted during the determination of the application and subsequent variation and consolidation notice (EPR-QP3337AD-V002). The applicant has not provided an updated Human Health Risk assessment as part of this application (but has provided Air Quality modelling) as they believe the current health assessment remains valid.

We have compared emissions and impacts (maximum modelled concentrations) between the Air Quality Modelling Report of 2015 (to which the HHRA was based) to the Air Quality Modelling Report dated 2017.

AQ report	Parameter	Period	Background	PC (µg/m^3)	PEC (µg/m^3)
2015	Dioxins and Furans (fg/m^3)	Annual mean	17.6	0.79	18.4
2017				0.77	18.37

In light of the above data, we are satisfied that predicted impacts between 2015 and 2017 remain consistent with each other allowing the previous human health risk assessment to remain valid.

5.3.3 Particulates smaller than 2.5 microns

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

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

The HPA (now PHE) addresses the issue of the health effects of particulates in their September 2009 statement 'The Impact on Health of Emissions to Air from Municipal Incinerators'. It refers to the coefficients linking PM_{10} and $PM_{2.5}$ with effects on health derived by COMEAP and goes on to say that if these coefficients are applied to small increases in concentrations produced, locally, by incinerators; the estimated effects on health are likely to be small. PHE note that the coefficients that allow the use of number concentrations in impact calculations have not yet been defined because the national experts have not judged that the evidence is sufficient to do so. This is an area being kept under review by COMEAP.

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

PHE also point out that in 2007 incinerators contributed 0.02% to ambient ground level PM_{10} levels compared with 18% for road traffic and 22% for industry in general. PHE noted that in a sample collected in a day at a typical urban area the proportion of $PM_{0.1}$ is around 5-10% of PM_{10}. It goes on to say that PM_{10} includes and exceeds $PM_{2.5}$ which in turn includes and exceeds $PM_{0.1}$.

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

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

5.3.4 Assessment of Health Effects from the Installation

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

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

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

The Applicant's assessment of the impact has indicated that emissions screen out as insignificant; or where the impact has not been screened out as insignificant, the assessment shows that predicted environmental concentrations are well within air quality standards or environmental action levels.

We have compared Air Quality Modelling (2017) with that undertaken in 2015 to confirm that the previous human health assessment remains accurate / within the scope of emissions emitted.

Overall, taking into account the conservative nature of the impact assessment (i.e. that it is based upon an individual exposed for a life-time to the effects of the highest predicted relevant airborne concentrations and consuming mostly locally grown food), it was concluded that the operation of the proposed facility will not pose a significant carcinogenic or non-carcinogenic risk to human health.

Public Health England and the Local Authority Director of Public Health were consulted on the Application and concluded that they had no significant concerns regarding the risk to the health of humans from the installation. The Food Standards Agency was also consulted during the permit determination process and it concluded that it is unlikely that there will be any unacceptable effects on the human food chain as a result of the operations at the Installation. Details of the responses provided by Public Health England, the Local Authority Director of Public Health and the FSA to the consultation on this Application can be found in Annex 2.

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

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

5.4.1 Sites Considered

Designated Habitats sites (i.e. Special Areas of Conservation, Special Protection Areas and Ramsar) located within 10Km of the Installation:

- South Wight Maritime SAC
- Briddlesford Copses SAC
- Solent Maritime SAC
- Isle of Wight Downs SAC
- Solent & Southampton Water Ramsar
- Solent & Southampton Water SPA (or proposed SPA)

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

- Parkhurst Forest SSSI

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

- Parkhurst Forest
- Rodge Brook Scrubs
- Parkhurst Forest – Noke Common
- Parkhurst Forest – Marks Corner
- Kitbridge Farm
- Noke Plantation
- Alvington Manor Chalk Pit
- Parkhurst Forest
- Parkhurst Forest
- Alvington Manor Chalk Pit

5.4.2 Habitats Assessment

The Applicant's Habitats assessment was reviewed by the Environment Agency, 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).

Our assessment of impacts on habitats sites is included within the Appendix 11 form, which was sent to Natural England for information. We have attached a copy within the annex to this document.

Within this assessment we have concluded the following:-

South Wight Maritime SAC	All emissions screened out as insignificant [PC/ES]	SAC not considered sensitive to Acid Deposition / Nutrient N Deposition
Briddlesford Copses SAC		Acid Deposition = 0.19% of CL
		Nutrient N Deposition = 0.27% of CL
Solent Maritime SAC		Acid Deposition = 0.01-0.02% of CL

		Nutrient N Deposition = 0.03-0.05% of CL
Isle of Wight Downs SAC		Acid Deposition = 0.04% of CL
		Nutrient N Deposition = 0.10-0.11% of CL
Solent & Southampton Water Ramsar / SPA		Acid Deposition = 0.04-0.23% of CL
		Nutrient N Deposition = 0.12-0.72% of CL

A copy of this assessment has been placed on our public register.

5.4.3 SSSI Assessment

The Applicant's assessment of SSSIs was reviewed by the Environment Agency, who agreed with the assessment's conclusions, that the proposal does not damage the special features of the SSSI(s).

Our assessment of impacts on SSSIs is included within a completed CROW form which has been placed on our public register. We have also attached a copy as annex to this document.

Parkhurst Forest SSSI	All emissions screened out as insignificant	Acid Deposition = 0.44-1.52% of CL
		Nutrient N Deposition = 0.47-1.6% of CL

5.4.4 Assessment of other conservation sites

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

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

Critical levels and loads are set to protect the most vulnerable habitat types. Thresholds change in accordance with the levels of protection afforded by the legislation . Therefore the

thresholds for SAC SPA and SSSI features are more stringent than those for other nature conservation sites.

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

Long Term

Site	Site type	Parameter / period [note1]	EQS	Background Concentration	PC µg/m^3	PC / ES %
Alvington Manor Chalk Pit	Ancient Woodland	NOx (AM)	30	11.6	0.05	0.2%
Parkhurst Forest				14.7	0.40	1.3%
				11.4	0.06	0.2%
				12.6	0.12	0.4%
Rodge Brook Scrubs	LWS			10.6	0.07	0.2%
Parkhurst Forest				11.6	1.90	6.3%
Noke Plantation				14.7	0.12	0.4%
Kitbridge Farm					0.79	2.6%
					0.34	1.1%
					0.73	2.4%
Alvington Manor Chalk Pit	Ancient Woodland	SO_2 (AM)	20	6.7	0.012	0.06%
Parkhurst Forest					0.099	0.49%
					0.015	0.07%
					0.030	0.15%
Rodge Brook Scrubs	LWS				0.017	0.08%
Parkhurst Forest					0.476	2.38%
Noke Plantation					0.031	0.15%
Kitbridge Farm					0.198	0.99%
					0.084	0.42%
					0.182	0.91%
Alvington Manor Chalk Pit	Ancient Woodland	Ammonia (AM)	1	1.89	0.002	0.2%
Parkhurst Forest					0.017	1.7%
					0.003	0.3%
					0.005	0.5%
Rodge Brook Scrubs	LWS				0.003	0.38%
Parkhurst Forest					0.084	8.4%
Noke Plantation					0.005	0.5%
Kitbridge Farm					0.035	3.5%
					0.015	1.5%
					0.032	3.2%

(AM = Annual mean)

Short Term

Site	Site type	Parameter/ period [note1]	EQS	Background Concentration	PC µg/m^3	PC / ES %
Alvington Manor Chalk Pit	Ancient Woodland	NOx (DM)	75	23.3	1.06	1.4%
Parkhurst Forest				29.5	2.82	3.8%
				22.8	1.15	1.5%
				25.2	2.48	3.3%
Rodge Brook Scrubs	LWS			20.8	1.41	1.9%
Parkhurst Forest				33.5	19.64	26.2%
Noke Plantation					1.19	1.6%
Kitbridge Farm					4.54	6.1%
					1.99	2.7%
					4.98	6.6%
Alvington Manor Chalk Pit	Ancient Woodland	HF (DM)	5	0.5	<0.001	0.005%
Parkhurst Forest					0.002	0.040%
					<0.001	0.006%
					0.001	0.012%
Rodge Brook Scrubs	LWS				<0.001	0.007%
Parkhurst Forest					0.001	0.189%
Noke Plantation						0.013%
Kitbridge Farm					0.004	0.079%
					0.002	0.033%
					0.004	0.072%
Alvington Manor Chalk Pit	Ancient Woodland	HF (WM)	0.5	0.5	0.00024	0.05%
Parkhurst Forest					0.00195	0.39%
					0.00030	0.06%
					0.00061	0.12%
Rodge Brook Scrubs	LWS				0.00034	0.07%
Parkhurst Forest					0.00948	1.90%
Noke Plantation					0.00061	0.12%
Kitbridge Farm					0.00393	0.79%
					0.00167	0.33%
					0.00364	0.73%

DM = Daily mean, WM = Weekly mean)

The tables above show that the PCs are less than 100% of the relevant standards.

We are satisfied that the Installation will not cause significant pollution at the sites. The Applicant is required to prevent, minimise and control emissions using BAT, this is considered further in Section 6.

5.5 Impact of abnormal operations

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

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

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

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

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

- Dioxin emissions of 10 ng/m^3 (100 x normal)
- Mercury emissions are 5 times those of normal operation
- NO_x emissions of 400 mg/m^3 (1.0 x normal)
- Particulate emissions of 150 mg/m^3 (5 x normal)
- Metal emissions other than mercury are 5 times those of normal operation
- SO_2 emissions of 380mg/m^3 (1.9 x normal)
- HCl emissions of 1520 mg/m^3 (25.4 x normal)
- PCBs (100 x normal)

Parameter	**Normal Concentration**	**Data presented in application**	
Dioxins	0.1 ng/Nm^3	10 ng/Nm^3	(100 x normal)
Mercury	0.05 mg/Nm^3	0.25 mg/Nm^3	(5 x normal)
NOx	400 mg/Nm^3	400 mg/Nm^3	(1.0 x normal)
Particulates	30 mg/Nm^3	150 mg/Nm^3	(5 x normal)
Metals (other than mercury)	0.05 mg/Nm^3	0.25 mg/Nm^3	(5 x normal)
	0.5 mg/Nm^3	2.5 mg/Nm^3	(5 x normal)
SO_2	200 mg/Nm^3	380 mg/Nm^3	(1.9 x normal)
HCL	60 mg/m^3	1,520 mg/m^3	(25.4 x normal)
PCBs	0.1 ng/Nm^3	10 ng/Nm^3	(100 x normal)

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

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

Pollutant	**EQS / EAL**		**Back-ground**	**Process Contribution (PC)**		**Predicted Environmental Concentration (PEC)**	
	µg/m³		**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
NO_2	200	2	17.4	42.8	21.4	60.1	30.1
PM_{10}	50	3	27.7	1.7	3.5	29.5	58.9
SO_2	266 350	4 5	13.4 13.4	158.3 115.7	59.5 33	171.7 129.1	64.6 36.9
HCl	750	7	0.4	956.2	127.5	956.6	127.5
HF	160	7	1	1.3	0.8	2.3	1.4
Hg	7.5	7	0.002	0.42	5.6	0.42	5.6
Sb	150	7	0.0005	0.47	0.3	0.47	0.3
As	15	7	0.0009	0.47	3.2	0.47	3.2
Co	6	7	0.00007	0.47	7.9	0.47	7.9
Cu	200	7	0.005	0.47	0.2	0.48	0.2
Mn	1500	7	0.004	0.47	<0.1	0.148	<0.1
N	30	7	0.002	0.47	1.6	0.48	1.6
V	1	6	0.001	0.19	18.6	0.19	18.7
Cr (II)(III)	150	7	0.003	0.47	0.3	0.48	0.3

PAH as benzo[a]pyrene
1 Annual Mean
2 99.79th %ile of 1-hour means
3 90.41st %ile of 24-hour means
4 99.9th ile of 15-min means
5 99.73rd %ile of 1-hour means
6 max daily mean
7 1-hour average

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

1	PM_{10}
2	HF
3	Hg
4	Sb
5	As
6	Co
7	Cu
8	Mn
9	N
10	Cr (II)(III)

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

1	NO_2
2	SO_2
3	V

For the following emissions, the PEC is greater than the short term ES. We should therefore consider whether additional measures are required.

1	HCl

Pollutant	**EQS / EAL**		**Back-ground**	**Process Contribution (PC)**		**Predicted Environmental Concentration (PEC)**	
	µg/m³		**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
HCl	750	7	0.4	956.2	127.5	956.6	127.5

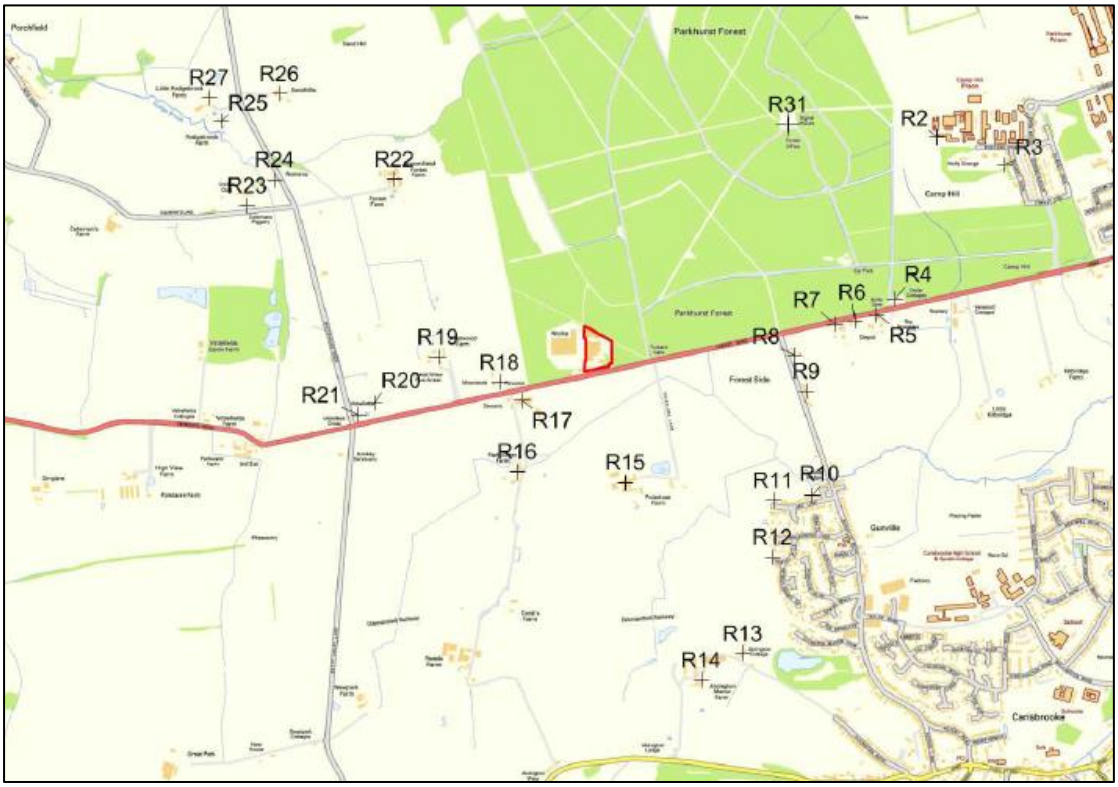
HCl has been based upon no abatement (i.e. all abatement systems failing together). For this extreme scenario to occur, all candles within the ceramic filter would have to have failed consecutively, urea injection (SNCR) completely interrupted / unavailable, along with Lime Injection cessation. In reality, all of these systems are unlikely to fail together.

The operator considers that in reality, the probability of such event occurring to be highly unlikely (all abatement failing together).

The above impacts have been based upon the maximum impact within the modelled grid area for the dispersion modelling. We asked the applicant to justify such abnormal emissions impact by consider the impact at the 'most impacted receptor' for which the following detail has been provided.

Location [Receptor experiencing maximum predicted impact – out of 34 locations identified]	**Pollutant**	**EQS / EAL**		**Back-ground**	**Process Contribution (PC)**		**Predicted Environmental Concentration (PEC)**	
		µg/m³		**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
R17 (see map below)	HCl	750	7	0.4	224.1	29.9	224.5	29.9

In addition to this, in the event of such systematic failure (of SNCR or ceramic filter abatement), then the plant is designed to enter automatic shutdown mode, which includes the immediate cessation of waste charging.



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, based upon:-

- the impact has been based upon an emission concentration which considers all abatement plant failing simultaneously, which in reality is unlikely to occur as an event, and if such event was to occur, the plant would automatically enter shutdown mode / cease waste feed.
- the predicted impact at receptor R17 [for which the applicant has confirmed as being the location / receptor experiencing the maximum impact offsite] is considered acceptable in that this this does not result in any exceedance to the environmental standard.

6. Application of Best Available Techniques

6.1 Scope of Consideration

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

- The first issue we address is the fundamental choice of incineration technology. There are a number of alternatives, and the Applicant has explained why it has chosen one particular kind for this Installation.
- We then consider in particular control measures for the emissions which were not screened out as insignificant in the previous section on minimising the installation's environmental impact. They are: NO_2, SO_2, VOC's, Cd & Tl, As, and Ni.
- We also have to consider the combustion efficiency and energy utilisation of different design options for the Installation, which are relevant considerations in the determination of BAT for the Installation, including the Global Warming Potential of the different options.
- Finally, the prevention and minimisation of Persistent Organic Pollutants (POPs) must be considered, as we explain below.

Chapter IV of the IED specifies a set of maximum emission limit values. Although these limits are designed to be stringent, and to provide a high level of environmental protection, they do not necessarily reflect what can be achieved by new plant. Article 14(3) of the IED says that BAT Conclusions shall be the reference for setting the permit conditions, so it may be possible and desirable to achieve emissions below the limits referenced in Chapter IV. However BAT Conclusions and a revised BREF for Incineration has not yet been published, although in progress, so the existing BREF and Chapter IV of the IED remain relevant.

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

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

6.1.1 Consideration of Furnace Type

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

The Waste Incineration BREF elaborates the furnace selection criteria as:

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

- The use of furnace design that, as far as possible, physically retains 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

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

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

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
	solid feeds more limited than grate (owing to refractory damage) often applied to hazardous Wastes					capacity
Fluid bed - bubbling	Only finely divided consistent wastes. Limited use for raw MSW often applied to sludges	1 to 10 t/h	Good mixing Fly ashes of good leaching quality	Careful operation required to avoid clogging bed. Higher fly ash quantities.	TOC <3 %	FGT cost may be lower. Costs of waste preparation
Fluid bed - circulating	Only finely divided consistent wastes. Limited use for raw MSW, often applied to sludges / RDF.	1 to 20 t/h most used above 10 t/h	Greater fuel flexibility than BFB Fly ashes of good leaching quality	Cyclone required to conserve bed material Higher fly ash quantities	TOC <3 %	FGT cost may be lower. Costs of preparation.
Oscillating furnace	MSW / heterogeneous wastes	1 – 10 t/h	Robust Low maintenance Long history	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
			Low NOX level Low LOI of bottom ash			
Pulsed hearth	Only higher CV waste (LCV >20 GJ/t) mainly used for clinical wastes	<7 t/h	can deal with liquids and powders	Bed agitation may be lower	Dependent on waste type	Higher specific cost due to reduced capacity
Stepped and static hearths	Only higher CV waste (LCV >20 GJ/t) Mainly used for clinical wastes	No information	Can deal with liquids and powders	Bed agitation may be lower	Dependent on waste type	Higher specific cost due to reduced capacity
Spreader - stoker combustor	RDF and other particle feeds Poultry manure Wood wastes	No information	Simple grate construction Less sensitive to particle size than FB	Only for well defined mono-streams	No information	No information
Gasification - fixed bed	Mixed plastic wastes Other similar consistent streams	1 to 20 t/h	Low leaching residue Good burnout if oxygen blown	Limited waste feed Not full combustion High skill level	Low leaching bottom ash	High operation/ maintenance costs

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
	Gasification less widely used/proven than incineration		Syngas available Reduced oxidation of recyclable metals	Tar in raw gas Less widely proven	Good burnout with oxygen	
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	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

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

This Installation previously employed Gasification technology, which had been determined as Best Available Techniques for this Installation.

Since this time, the technology provider “Energos” has gone into administration, and in doing so have removed their gasification system from the market. As a result of this, Amey LG Limited have had to look at alternative technologies.

We required the applicant to provide further information relating to the options appraisal for selecting an alternative – to the permitted gasification method (contained below).

Proposed method: moved bed incinerator.

This technology is not listed within the comparison of main applied combustion and thermal treatment technologies listed within Chapter 4 of IPPC Reference Document on the Best Available Techniques for Waste Incineration (August 2006) – the applicant has stated that this technology comprises features of both of grate furnaces and rotary kilns.

The IPPC Reference Document states that Chapter 4 cannot be considered to be entirely comprehensive. Other techniques may also provide for levels of performance that meet or exceed the BAT criteria later established in Chapter 5, and when applied locally those techniques may provide particular advantages in the situation in which they are used.

This means that whilst a ‘moved bed incinerator’ is not directly listed as a thermal treatment technique it can be considered where appropriate, subject to determining BAT requirements listed within chapter 5 of the reference document. We have assessed compliance with these requirements later within this document.

The IPPC Reference also states: an emerging technique is understood in this document as a novel technique that has not yet been applied in any industrial sector on a commercial basis.

The Operator has provided justification for this non-specified technique being considered a combination of both a grate furnaces and a rotary kiln

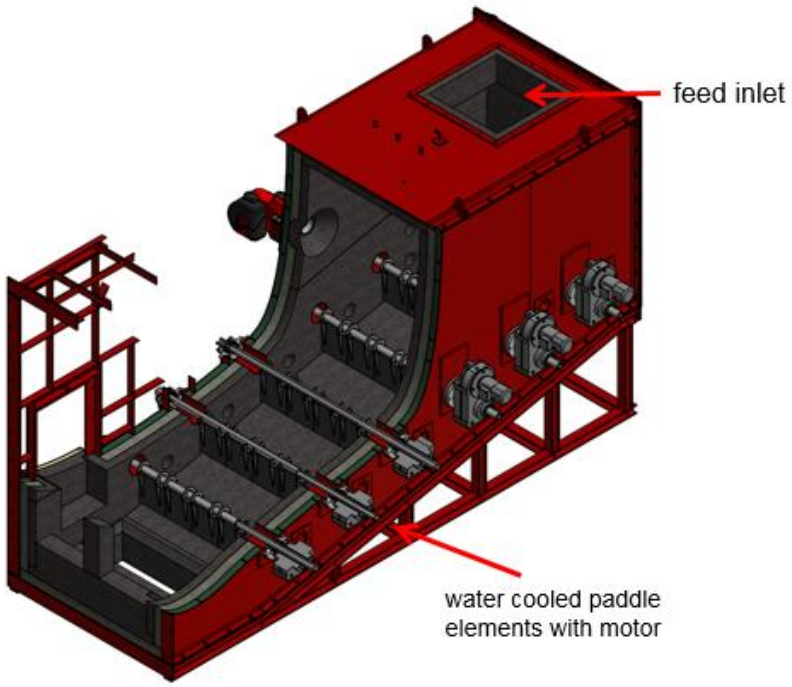
Similarity to grate furnace

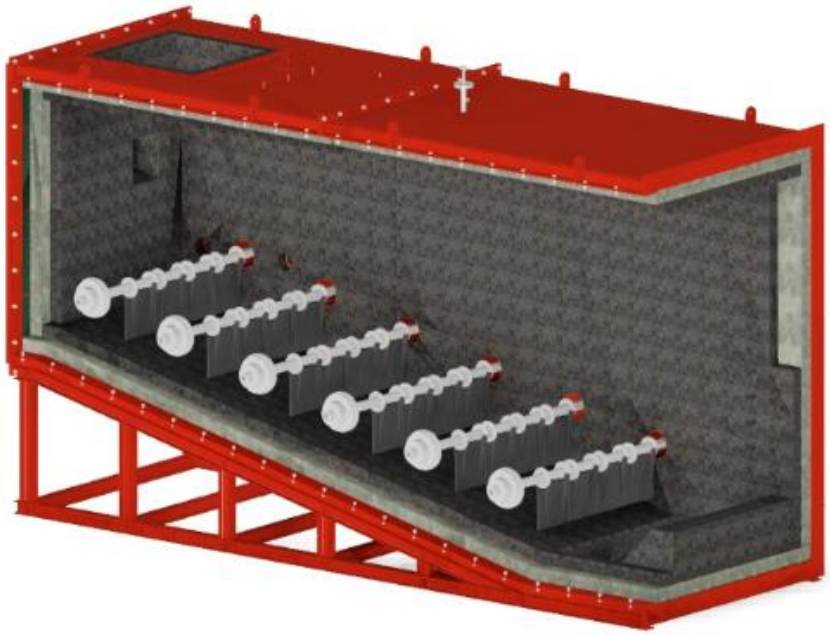
The primary combustion chamber of the moved bed incinerator is inclined (like a moving grate incinerator, and rotary kiln) with the waste feed inlet located at the highest point, aiding one directional travel (by gravity).

In order to aid / agitate the waste input as it travels down through the bed, a series of horizontal water cooled shafts (on rotational arms) are situated at a specified height above the bed. Attached to the shafts (directly above the bed of the incinerator) are a series of paddles. The rotational arms are individually controlled (speed and direction of rotation) by computer controlled system, and this allows the paddles to agitate and transport the waste through the incinerator bed in a controlled manner, according to combustion controls.

The paddle system serves to replicate the transport and agitation of the waste, as is provided by the movement of a grate within a moving grate incinerator, or rotation of rotary kiln. This is where the applicant suggests similarities to moving grate technology (by inclined bed / grate, and method of movement to transport the waste under controlled conditions).

The following illustrated drawings provide visualisation for the bed of the incinerator and paddle system:-





Similarity to rotary kiln

In the absence of a grate (as outlined above) the incinerator is refractory lined with high quality refractory material, and base of the bed being made of refractory concrete with aluminium oxide content. This provides robust conditions for combustion to take place (at required temperatures). A refractory material is a material that retains its strength at high temperatures such as those required for incineration and co-incineration.

In order to maintain suitable oxygen conditions for combustion to take place, air injection points are provided laterally within the bed. These are also linked to computer controlled system regulating correct air requirements.

The operator has stated that the absence of a grate (along with under grate air supply) reduces the carry-over of ashes to the boiler.

Consideration of Moved Bed technique to other techniques listed within the BREF.

We have considered the above detail, including:

- detail on moving grate and rotatory kiln technology
- justification relating to the scale of project
- existing permitted waste types, and
- evidence of operation within the Industrial Emissions Directive requirements,

We are satisfied that this technology can be considered appropriate for the location of the site, and available waste types and throughputs.

Justification for consideration of alternative options

The decision to change technology was triggered by Energos going into administration. Energos going into administration removed their gasification system from the market therefore this technology was no longer available for the operator to install and commission on site. At the time of this event occurring, the site had gained both its environmental permit (permitting the listed activity) and full planning permission (based upon the scale of plant and various conditions relating to the permitted facility).

The Operator has a number of constraints to consider when considering alternative technologies. The main constraints include:-

- Retain design and scale as permitted by both Environmental Permit and Planning Permission in order to limit the changes necessary by any relevant variation.
- The Energos administration had no immediate impact on the waste treatment building or operations – not subject to variation by this permit
- Changes need to comply with long term waste management contract between Amey and the Isle of Wight Council

Any alternative techniques considered therefore had to meet the following:-

- Ability to meet existing legal operational parameters such as emission limits;
- Ability to thermally treat the wastes already permitted - from the MPT plant;
- Ability to fit within the approved building envelope, including stack height, and to remove the risk from failing to secure a new planning permission;
- Ability to meet the scale of the project in accordance with permitted throughputs;
- Ability to deliver a similar gross electrical output; and
- Ability to meet the contractually agreed operational availability.

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

1. Delivery of the Energy solution (base case – current permitted activity which is no longer available)
2. Alternative gasification plant
3. Alternative EfW technology
4. Export RDF for treatment on mainland UK
5. Export all wastes to mainland UK

We have considered the above techniques excluding i) the base case (point 1) as “unavailable”, and ii) the exporting of RDF / wastes to mainland UK (points 4 and 5) as this falls outside of the remit for BAT assessment. The applicant also discounted these options due to being “unavailable” for the following reasons:-

- Unsustainable during contract duration,
- Approach would depart from the Isle of Wight Council’s policy to generate at least 7.4MW of energy from waste arising on-island, *(Policy SP6, Isle of Wight Core Strategy (Adopted 2012).*

This left 2 options (within the scope of project).

2. Alternative gasification plant

3. Alternative EfW technology

2. Alternative gasification Plant

Three potential gasification plants were taken forward (with consideration of current treatment capacities) for consideration. Of these:-

- Gasification technology 1 - Non-operational / no operating record
- Gasification technology 2 – Costs outside of affordability envelope / financial model
- Gasification technology 3 – Plant size beyond available footprint area.

For the above reasons, the above gasification processes were discounted as not being available to the applicant (for the reasons stated above). Being outside the costs for their business model does not mean it is not available to the sector although we are satisfied that an alternative gasification plant would not provide any advantages over and above the proposed moved bed plant and that gasification does not need to be considered further in the assessment.

3. Alternative EfW technology

The operator therefore considered alternative EfW treatment options, including direct incineration – for the scale of plant intended / previously approved.

The operator identified a single alternative treatment technology (within the pre-agreed size / scale of approval) in the form of direct incineration. This is achieved using a “moved bed incinerator” technology as supplied by Michaelis, as proposed as the furnace technology in this application.

The Operator considers that the moved bed technology includes a number of attributes for moving grate incineration – the difference being that waste is agitated by paddles on a fixed bed incline, rather than moving grate incline. The rotation of the paddles can be controlled independently by control unit, and are programmed to ensure that waste is incinerated within the legislative requirements of IED. The control system also controls air supply which is supplied laterally (rather than under grate) controlling incineration of the waste (temperatures and combustion airflow).

The attribute similar to rotary kiln relates to the refractory concrete lining which is included within the scope of this design. The applicant considers this to provide a more robust solution than complex cooled grate systems. The bed does not rotate as would be the case for the rotary kiln. The advantage of this over a rotary kiln relate to air injection points, burner firing and measurements along the incineration chamber, which would otherwise prove more difficult.

As a result of the above, we have considered the features of the moved bed technology (to moving grate / rotary kiln), along with the information provided within the application including details of operational plants provided in evidence:-

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
Rotary Kiln	Can accept liquids and pastes solid feeds more limited than grate (owing to refractory damage) often applied to hazardous Wastes	<10 t/h	Very well proven with broad range of wastes and good burn out even of HW	Throughputs lower than grates	TOC <3 %	Higher specific cost due to reduced capacity
Moved Bed	9 to18 MJ/kg, design point of 11.7 MJ/kg Municipal and other heterogeneous solid wastes	Mechanical capacity 5 tph Plant is designed to treat RDF : CV 11.7MJ/kg	The base of the furnace is of refractory concrete with aluminium oxide content - high resistance to abrasion (as per rotary kilns) - robust solution which is less complex	Paddles require cooling (which is achieved through water cooling in the shaft, with low cooling energy requirements) – rather than cooling of a grate based system.	Application states IED limits for TOC / LOI (in bottom ash) can be achieved.	**Bamberger Kaliko -** Germany constructed in 2010. *First system of its kind, incentive from EU, proved both economical and*

		(density of 250-350 kg/m^3)	than a cooled grate system. The absence of a grate removes the requirement for bottom up air supply - reducing the carry-over of ashes to the boiler. (Air is supplied laterally). Movement of waste is performed by the paddles – which are independently controlled. Speed can be controlled similar to moving grate to ensure the waste doesn't move too fast (or too slow) through the bed. The plant is able to accept RDF with a range of CV's and compositions (at a wider range than the previous Energos process as permitted). Combustion air is preheated through a gas-air heat exchanger after the boiler – improving the efficiency of the process.	Would not be suited for large items - specific design parameters included in application : - • 90% by weight less than 150mm • 97% by weight less than 200mm • Particle volume less than 300cm^3 Shredder on site for oversized items / trommels carry out the majority of the size segregation of materials.	Evidence has been provided of operational plants (such as Bamberger Kaliko)	*technical in application of small scale on continuous operation.*

As a result of the above, along with consideration of the evidence of other operational plants (see below) operating within the EU (and thus subject to meeting the requirements of Chapter IV of the Industrial Emissions Directive) we are satisfied with the justification provided by the operator.

We have considered the operational parameters within the existing permit, and compared these to those proposed within the Moved Bed incinerator:-

	Energos – Gasification	Michaelis – Moved Bed
Waste throughput, Tonnes/line	44,000 tonnes/annum permitted.	44,000 tonnes/annum permitted.
Number of line(s)	1 line	1 line
	4 tonnes per hour	5 tonnes per hour
Maximum operating hours	7,800 hrs per annum	7,800 hrs per annum
Waste processed	RDF (Refuse Derived Fuel)	RDF (Refuse Derived Fuel)
Furnace technology	Gasification : generation of electricity using RDF in a gasification plant with energy recovery	Moved Bed *(utilising a fixed refractory lined bed, with a series of lateral shafts holding paddles above the bed / waste mass – with the paddles rotating independently in order to facilitate waste transportation).*
Auxiliary Fuel	Gas Oil [Light Fuel Oil]	Gas Oil [Light Fuel Oil]
Stack	Height, 26 m	Height, 26 m
Nominal Boiler Output	nominal waste heat boiler capacity of 11.7 MW	nominal boiler heat transfer capacity as 13.5 MW
Electricity exported	1.8 MW exported	2.28 MW (net export)

Considering the above detail, along with emission performance we are satisfied that the moved bed incinerator provides comparable performance to that of the existing permitted gasification activity, for which the moved bed incinerator will replace by this variation.

Operational evidence

The applicant provided a list detailing 7 commercially operational plants (utilising such Michaelis technology) within the schedule 5 response, meaning that this is not considered by this terminology as “emerging”.

Of the 7 plants identified within the Schedule 5 response, three such plants are located within the European Union, and therefore also subject to meeting any relevant requirements of the Industrial Emissions Directive (Chapter IV of the IED). A number of the plants identified incinerate mixed municipal waste (following shredding / preparation) which is relevant to this Installation, and this demonstrates that the requirements of Annex IV can be achieved.

In consideration of information provided by the applicant (7 operational plants) - namely the waste throughputs (annual and hourly basis – i.e. 5 tonners per hour), and waste input types (including pre-processed municipal solid waste), we consider that for the scale and waste types already permitted by this permit, that this technology can be considered as appropriate - where compliance to IED has already been demonstrated.

We are satisfied that the proposed furnace technology comprising ‘moved bed incinerator’ can be considered BAT in for this application.

The Applicant proposes to use gasoil as support fuel for start-up, shut down and for the auxiliary burners. The permit already permits this fuel choice. The site will use a low volume of gas oil for supplementary firing of burners during plant start up and shut down operations. This volume of fuel is predicted at being under 200 litres per annum.

Boiler Design

A new boiler will feature as part of the change for listed activity. The boiler will be a Michaelis specified Modular Boiler, which will be mounted horizontally - containing inner insulation and refractory, and an outer shell made from steel.

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

- ensuring that the steam/metal heat transfer surface temperature is a minimum where the exhaust gases are within the de-novo synthesis range –
- *A combustion air pre-heater (containing air-tube pipe bundles) is integrated within the boiler. After the combustion gas pre-heater the gas temperature will be approximately 140°C;*
- design of the boilers using CFD to ensure no pockets of stagnant or low velocity gas – *this is included within the variation as a pre-operational requirement;*
- Design of boiler surfaces to prevent boundary layers of slow moving gas - *protective evaporator surfaces in front of the super heater surfaces to avoid a critical pairing of wall temperature and flue gas temperature.*
- use a boiler design that allows gas temperatures to reduce sufficiently before the convective heat exchange bundles (e.g. the provision of sufficient empty passes) - *the second combustion chamber has the function of an empty boiler pass.*

Any of the options listed in the BREF and summarised in the table above can be BAT.

The Applicant has chosen a furnace technique which whilst not listed within the BREF, is considered to contain attributes of both a moving grate and rotary kiln for the reasons outlined earlier. We are satisfied that the Applicant has provided sufficient justification to show that their technique is BAT, along with evidence to support the technique as being available by providing evidence of other plants located within the EU, and also subject to compliance under Chapter IV of the IED. In addition to this, this is an application for variation, and the application demonstrates that the chosen technique is at least comparable to existing BAT (as determined within the current permit for the Energos plant).

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

We have included pre-operational conditions covering commissioning, ash sampling and CFD modelling, and improvement conditions covering reporting of commissioning and verification of incineration requirements (with comparison to CFD provided by pre-operational condition) and together these conditions will enable evidence to be provided to verify the above.

6.2 BAT and emissions control

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

The BREF lists the general factors requiring consideration when selecting 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 Smaller plant.	May "blind" more than fabric filters		Small plant. High temperature gas cleaning required.
Electrostatic precipitators	Low pressure gradient. Use with BF may reduce the energy consumption of the induced draft fan.	Not normally BAT.		When used with other particulate abatement plant

The Applicant proposes to use ceramic filters for the abatement of particulate matter.

Previously, the Environment Agency determined the use of fabric filter technology (for the abatement of particulate matter) at this Installation as BAT. This related to the previous use of gasification technology by Energos for thermal treatment of the waste.

We asked the applicant to provide a justification for this change in particulate technology, considering that the applicant had previously justified bag filter technology as meeting BAT at this location.

The applicant confirmed within the Schedule 5 response that ceramic filtration is the technology which is supplied with the Michaelis technology (as standard), and for this the technology provider has a proven success rate using this technology as part of the design of the plant (moved bed).

The design of the moved bed plant includes lateral air injection points, rather than under grate air supply (up draft). The applicant claims that this reduces the level of fly ash contained within the exhaust gases (in comparison to that of an operational incinerator grate) and thus provides a lower particulate load for abatement.

In consideration of the above, and of the scale / size of the Installation, we agree that for this smaller plant, the justification above is acceptable.

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

We asked the applicant to provide additional detail on blinding, in order to reflect the potential increase of such instances occurring (to that of bag filter - as detailed above). The applicant responded by email on 25th July 2017 stating:-

"The control unit delivers a cleaning pulse of compressed air from the clean side of the filter every 90 seconds to minimise the risk of blinding. The control system also monitors the pressure drop across the filter during operations. The cleaning pulse duration and frequency can then be modified to account for actual performance".

During flue gas treatment, filtered particulate matter accumulates on the outer surface of the ceramic filter. This causes pressure to increase on the inlet side and decrease on the outlet side of the filter. Pressure sensors monitor such pressure conditions (on each individual filter unit) across the filter, and a pre-set value is determined at which point a cleaning pulse of compressed air is applied from the outlet side of the filter, to allow excessive accumulation to be released from the filter, and collected for disposal.

The status of individual ceramic filter units are also monitored for cracks by the same method (monitoring pressure differential). If a crack is detected, the individual unit is bypassed to prevent the escape of particulate matter, and is then removed and replaced as soon as practicable.

In addition to the above, and in order to further reduce potential blinding, a factory pre-coating has been applied to each finger unit.

Filter units will be replaced at the end of their service life and when required by preventative maintenance. Routine inspection of the filters will be carried out during annual shutdown (planned maintenance) with a rolling replacement of filter units being carried out as part of this.

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

6.2.2 Oxides of Nitrogen

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

reduction (SCR)	Reduces CO, VOC, dioxins	Re-heat required – reduces plant efficiency		
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:

- Low NO_x burners – this technique reduces NO_x at source and is defined as BAT where auxiliary burners are required. *The applicant has confirmed this in answer to BATc40 within annex 3 (Michaelis BAT information)*
- Optimise air injection – this technique is BAT for all plant. *The applicant has confirmed that air injection is independent and controllable, being more flexible than regular grate systems.*

The installation is not equipped with flue gas recirculation (a technique which is considered to provide reductions to reagent consumption for secondary NOx control, and can offer overall increases to energy recovery). The operator provided confirmation of this along with justification for non-inclusion (within the schedule 5 response).

> "Flue gas recirculation is not included due to controlled combustion temperatures of the moved bed incinerator (and waste composition not indicating the presence of high NOx in raw combustion gases). Primary combustion air is introduced laterally to the combustion chamber through strategically placed air inlets on the unit. The placement of these inlets has been determined through CFD modelling, which includes the influence of the waste paddles on air mixing within the primary combustion chamber. The location of the inlets is designed to reduce NOx generation within the combustion chamber.

Whilst flue gas re-circulation is not employed, a proportion of heat is recovered from the flue gas to pre-heat incoming combustion air which does improve the thermal efficiency of the installation.

The design of the moved bed incinerator does not include a grate or air injection from beneath such grate (as per a conventional grate furnace) – altering air injection. This method also helps to reduce the volume of fly ash.

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 proposes to use SNCR with urea as the reagent. Urea solution will be injected into the hot flue gas at the entrance to the boiler/exit of the post-combustion chamber. Whilst emissions of NO_x were not screened out as insignificant, we have examined whether any exceedances to the relevant ES would be likely. The long term process contribution is marginally above 1% (at 4% at location of predicted maximum impact), and short term predicted environmental concentration is 21.3% of Environmental Standard – also predicted for worst case. We are therefore confident that there will be no breaches to relevant ES by operation at proposed NOx concentration.

The current permit includes emission limit values for NOx of a) 400 mg/m^3 based upon ½ hour average, and b) 200 mg/m^3 based on daily average. The operator has requested to retain the same limits within this variation, and is confident that these can be met with use of SNCR.

The installation is relatively small scale in comparison to other municipal waste incinerators – at only 5,000 kg/hour / 39,000 tonnes/annum, and therefore we recognise that consideration of SCR (which is often discounted from larger scale plants due to reductions to energy efficiency by exhaust gas re-heat and pressure drop) would not be beneficial at this installation.

The amount of urea used for NO_x abatement will need to be optimised to maximise NO_x reduction and minimise NH_3 slip. We have included an improvement condition requiring the Operator to report to the Environment Agency on optimising the performance of the NO_x abatement system. The Operator is also required to monitor and report on NH_3 and N_2O emissions every 6 months.

6.2.3 Acid Gases, SO_x, HCl and HF

Acid gases and halogens : Primary Measures				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Low sulphur fuel, **(< 0.1%S gasoil or natural gas)**	Reduces 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	Higher solid waste residues		All plant

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

The Applicant proposes to implement the following primary measures:

Use of low sulphur fuels for start up and auxiliary burners – gas should be used if available, where fuel oil is used, this will be low sulphur (i.e. <0.1%), this will reduce SO_x at source. The existing permit authorises the use of fuel oil. The applicant is not seeking a change to this by this variation.

- Management of heterogeneous wastes – this will disperse problem wastes such as PVC by ensuring a homogeneous waste feed.

There are three recognised techniques for secondary measures to reduce acid gases. These are wet, dry and semi-dry. Wet scrubbing produces an effluent for treatment and disposal in compliance with Article 46(3) of IED. It will also require reheat of the exhaust to avoid a visible plume. Wet scrubbing is unlikely to be BAT except where there are high acid gas and metal components in the exhaust gas as may be the case for some

hazardous waste incinerators. In this case, the Applicant does not propose using wet scrubbing, and the Environment Agency agrees that wet scrubbing is not appropriate in this case.

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

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

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

In this case, the Applicant proposes to use a dry system using hydrated lime:-

The lime based adsorbents have been specified to provide effective adsorption for SO_2, HCl and HF. These additives are introduced separately to the flue gas treatment system. Dosage rates are controlled by CEMS equipment (which monitor the concentration of gases within the flue gas). Reaction products and fly ashes are then removed via the ceramic filter prior to abated exhaust gases being released to atmosphere.

The Environment Agency is satisfied that this is BAT

6.2.4 Carbon monoxide and volatile organic compounds (VOCs)

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

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

6.2.5 Dioxins and furans (and Other POPs)

Dioxins and furans				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Optimise combustion control	All measures will increase oxidation of these species.		Covered in section on furnace selection	All plants
Avoid *de novo* synthesis			Covered in boiler design	All plant
Effective Particulate matter removal			Covered in section on particulate matter	All plant
Activated Carbon injection	Can be combined with acid gas absorber or fed separately.	Combined feed rate usually controlled by acid gas content.		All plant. Separate feed normally BAT unless feed is constant and acid gas control also controls dioxin release.

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

- optimisation of combustion control including the maintenance of permit conditions on combustion temperature and residence time, which has been considered in 6.1.1 above;
- avoidance of de novo synthesis, which has been covered in the consideration of boiler design;
- the effective removal of particulate matter, which has been considered in 6.2.1 above;
- injection of activated carbon. This can be combined with the acid gas reagent or dosed separately. Where the feed is combined, the combined feed rate will be controlled by the acid gas concentration in the exhaust. Therefore, separate feed of activated carbon would normally be considered BAT unless the feed was relatively constant. Effective control of acid gas emissions also assists in the control of dioxin releases.

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

6.2.6 Metals

Metals				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Effective Particulate matter removal			Covered in section on particulate matter	All plant
Activated Carbon injection for mercury recovery	Can be combined with acid gas absorber or fed separately.	Combined feed rate usually controlled by acid gas content.		All plant. Separate feed normally BAT unless feed is constant and acid gas control also controls dioxin release.

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

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

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

6.3 BAT and global warming potential

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

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

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

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

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

Factors influencing GWP and CO_2 emissions from the Installation are:

On the debit side

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

On the credit side

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

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

This is a variation to an existing permit authorising the operation of a Section 5.1 Part A(1)(b) – Incineration. The existing permit was previously granted with consideration of global warming potential, and this variation does not alter any of the existing waste types or quantities which have previously been accepted.

This variation does include the use of SNCR for secondary NOx abatement.

We did not require the operator to compare energy efficiency between SNCR and SCR abatement types within their application / BAT assessment. This decision was taken in light of evidence supplied within other Energy from Waste applications to date (to the Environment Agency), for which justification for SNCR has been dominant within such responses, and accepted by the Environment Agency.

Only in a minor number of cases has SCR been justified, such as where sites are located within AQMA's for NOx, or in close proximity to receptors sensitive to Ammonia emissions, and thus additional NOx / ammonia reduction has been required in order to support the local environment. The downside to providing such further emission reductions is that SCR systems require a significant amount of additional energy (to that of SNCR) in order to operate, and thus where employed, result in significant energy efficiency reductions for the Installation.

The impact assessments provided with this application show that additional NOx / ammonia control (above the performance of SNCR) is not required.

The Environment Agency's experience of SNCR/SCR justification (within Energy from Waste application) has been accepted on the basis that the additional energy requirements to operate SCR (over SNCR) outweigh the benefits for operating such system. We have evidence within our Energy from Waste applications that larger scale plants have justified not including SCR on the basis of significant reductions in energy efficiency to such installations. For these reasons we are satisfied that such justification is not required on this basis, and that given the scale of operation for this Installation, consider that further energy efficiency reductions would not be viable for this application.

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

6.4 BAT and POPs

International action on Persistent Organic pollutants (POPs) is required under the UN's Stockholm Convention, which entered into force in 2004. The EU implemented the Convention through the POPs Regulation (850/2004), which is directly applicable in UK law. The Environment Agency is required by national POPs Regulations (SI 2007 No 3106) to give effect to Article 6(3) of the EC POPs Regulation when determining applications for environmental Permits.

However, it needs to be borne in mind that this application is for a particular type of installation, namely a waste incinerator. The Stockholm Convention distinguishes between intentionally-produced and unintentionally-produced POPs. Intentionally-produced POPs are those used deliberately (mainly in the past) in agriculture

(primarily as pesticides) and industry. Those intentionally-produced POPs are not relevant where waste incineration is concerned, as in fact high-temperature incineration is one of the prescribed methods for destroying POPs.

The unintentionally-produced POPs addressed by the Convention are:

- dioxins and furans;
- HCB (hexachlorobenzene)
- PCBs (polychlorobiphenyls) 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. The Permit requires that, in addition to the requirements of the IED, the WHO-TEQ values for both dioxins and dioxin-like PCBs should be monitored for

reporting purposes, to enable evaluation of exposure to dioxins and dioxin-like PCBs to be made using the revised TDI recommended by COT. The release of dioxin-like PCBs and PAHs is expected to be low where measures have been taken to control dioxin releases. The Permit also requires monitoring of a range of PAHs and dioxin-like PCBs at the same frequency as dioxins are monitored. We have included a requirement to monitor and report against these WHO-TEQ values for dioxins and dioxin-like PCBs and the range of PAHs as listed in the Permit. We are confident that the measures taken to control the release of dioxins will also control the releases of dioxin-like PCBs and PAHs. Section 5.2.1 of this document details the assessment of emissions to air, which includes dioxins and concludes that there will be no adverse effect on human health from either normal or abnormal operation.

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

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

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

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

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

6.5 Other Emissions to the Environment

6.5.1 Emissions to water

The existing permit authorises a discharge of uncontaminated surface water run off via interceptor. This variation does not change this condition.

6.5.2 Emissions to sewer

The existing permit does not permit a discharge to sewer.

The applicant has not sought to change this by this variation, however will review methods once the plant is operational.

Effluent will be generated at 200 l/hr (consisting of boiler blowdown water and products from the demineralisation plant) and will be removed from site every 2-3 days.

The application (and response to schedule 5 request for further information) confirms that process effluent will be captured and stored within a subsurface tank of 21 m^3, which will be periodically emptied (as and when

required) by licenced contractor for offsite disposal. Details relating to storage and containment are covered within section 4.2 of this document (site condition).

If the operator seeks to change effluent discharges – such as that of a discharge to sewer, then they will need to apply for a variation to the permit prior to making such change.

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

6.5.3 Fugitive emissions

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

The storage of wastes (and existing activities within the permit) will remain unchanged, with the exception of the incineration equipment.

SNCR using urea solution will be employed to reduce NOx emissions. Urea will be stored within a tank internal to the building (max 20 tonnes storage).

The process building includes fast closing doors in order to minimise the escape of any fugitive emissions.

Based upon the information in the application we are satisfied that appropriate measures will be in place to prevent and /or minimise fugitive emissions. We are satisfied that existing measures within the permit remain appropriate to control fugitive emissions, and that the changes prescribed by this application for variation will allow the Installation to continue preventing and / or minimising the impact from such emissions.

6.5.4 Odour

This variation does not permit any changes to the existing materials recycling facility as permitted.

The site is covered by an existing Odour Management Plan, and the requirements within such plan will remain largely unchanged. The applicant has stated within the application that some updates will be made to the plan prior to plant commissioning - to largely update references / names of responsible operators with specific requirements. We have included a pre-operational condition to require this change prior to commissioning.

In relation to the incineration plant (the subject of this change) the applicant has confirmed the following measures will be in place to prevent and /or minimise odours.

- Combustion air will be extracted from the waste bunker which will lower the air pressure in the bunker hall and reduce / eliminate odours escaping from the bunker area.
- The processing building is equipped with fast closing doors to minimise fugitive emissions.
- The building will be kept at a slight negative pressure to minimise the release of odours.

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

Waste acceptance is not altered by this variation.

6.5.5 Noise and vibration

This variation does not permit any changes to the existing materials recycling facility as permitted.

The site has been designed with consideration for minimising the impact from noise - on offsite receptors through building orientation, finishes and location of openings. In addition to this, the following measures are also employed:-

- Waste handling operations are carried out internal to building,

- The Installation is fitted with fast acting roller shutter doors to minimise the escape of internal noise,
- Audible reversing warning systems on mobile plant and vehicles will be of a type that has a minimal noise impact on nearby sensitive receptors (whilst maintaining safely requirements
- Use of plant with efficient exhaust sound reduction equipment
- Fitting efficient sound reduction equipment to plant where required
- Setting a speed limit for vehicles on site; and
- Implementing an efficient complaints procedure.

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

The application contained a noise impact assessment which identified local noise-sensitive receptors, potential sources of noise at the proposed plant and noise attenuation measures. The assessment included a comparative analysis of the noise impacts from the existing permitted Energos gasification plant (as permitted) to the 'Moved Bed Incinerator' plant (as the subject of this variation).

The assessment considered operational noise levels based on the guidance in British Standard - 'BS 4142:2014 – Methods for rating and assessing industrial and commercial sound' at the nearest sensitive receptors. This has been carried out using industry standard 3D noise modelling software, noise data from national guidance documents, information provided by the client, and measurements undertaken by the consultants.

The assessment predicts that the likelihood of adverse operational noise impacts will be low (at all receptors) during the daytime and night-time periods.

As previously predicted for the gasification plant (as permitted) the predicted operational noise levels for Michalis TT technology were below the representative background sound levels at all properties during daytime and night-time. Therefore, the likelihood of significant adverse operational noise impacts is predicted to be low for both periods.

Should this situation change once the site is fully operational, then existing permit condition 3.4.2 will allow the Environment Agency to require the operator to undertake a noise and vibration management plan.

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 reviewed the Applicant's assessment of environmental impact and are satisfied that there will not be significant pollution or risk to human health arising from the operation of the incinerator in the local community.

Substances not initially screened out as insignificant have PECs that are well below the ES values.

(ii) National and European ESs

Air quality ESs were considered in the air quality impact assessment. Emission limit values take into account the requirements of the Waste Incineration Directive.

There are no limits set for emissions to water or sewer in reflection of the situation / existing permit. Should the operator seek to make changes to the discharge (i.e. to sewer) then this will be subject to a separate variation application before permission is granted.

(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

We have included a pre-operational condition within the variation notice that requires a commissioning plan to be submitted to us. The plan will include measures to ensure environmental protection during commissioning.

6.6.2 Setting additional emission limit values to air (other than those stated within IED Chapter IV)

As previously stated, this application includes the addition of SNCR as a secondary NOx abatement technique. We have previously justified the use of this technique within 6.2.2 of this document.

The use of SNCR provides the additional emission of ammonia to exhaust gases. The applicant has assessed the impacts from such emissions, and we have covered this within sections 5.2 (health impacts) and 5.4 (ecological impacts). The ammonia emission has been based on a long term release concentration of 8.8 mg/m^3 at 11% oxygen (relevant reference condition for incineration plant).

As shown within the annex to this decision document), the highest predicted offsite impact is shown at Parkhurst Forest SSSI. The impact is predicted at 1.1% of the relevant environmental standard. This value is marginally above 1% threshold (for being considered 'insignificant'), and we are satisfied that this can be considered insignificant on account of i) modelling uncertainties – for which a conservative approach has been adopted within the modelling software, and ii) the assessment has been made against the more stringent environmental standard (critical level) of 1 for ammonia.

We therefore consider it appropriate to set a limit for Ammonia (in order to ensure that the emission is controlled) whilst obtaining further operational data (through monitoring) on ammonia emissions which can be used to assess against the predictive values used within the modelling. Whilst setting such limit we have considered the concentration at which the modelling was based upon (a long term release) and thus have to allow for headroom to allow potential peaks during short term releases. We have therefore set an ELV of 20 mg/m^3 with a foot note (Note 1) against this emission which states limit subject to reduction following the completion of improvement condition (which relates to SNCR optimisation). *We consider that some plants can achieve emissions of 10 mg/m^3, however cannot set a limit within the permit which the operator cannot*

meet from start of operations. The improvement condition will address this by considering operational data and a possible reduction to the ELV stated.

This will for a more accurate understanding of ammonia emissions (with consideration of operational monitoring). The Environment Agency may considered reducing the emission limit value if headroom is considered to be excessive.

Where any departure from this is considered (for example request to increase the ELV) then this will be subject to application for variation, for which assessment will need to cover any relevant impacts (including those at ecological receptors / updated habitats assessment for consultation with relevant authority) and seek approval for such increase prior to agreement being made.

6.7 Monitoring

We are going to include an additional requirement to monitor Ammonia (NH_3) and Nitrous oxide (N_2O) as a result of SNCR being introduced to this site. The applicant has confirmed that continuous monitoring (CEMs) will be used to undertake monitoring for these additional parameters.

Ammonia	20 mg/m^3	½-hr average and / or daily average	Continuous measurement	BS EN 14181 and BS EN 15267-3
Nitrous oxide (N_2O)	No limit set	½-hr average and / or daily average	Continuous measurement	BS EN 14181 and BS EN 15267-3

There are no other changes to existing monitoring requirements set within the permit (including the use of backup CEMS).

We are satisfied that changes to the incineration activity will not alter the ability to comply with these requirements.

Small amounts of N_2O arise from the operation of secondary NOx abatement. The Applicant will therefore be required to optimise the performance of the secondary NOx abatement system to ensure its GWP impact is minimised. We do not include limits for N_2O but require monitoring to be undertaken. We have included an improvement condition focusing on optimising the SNCR system.

There are no other changes to the monitoring requirements set within the permit by result of this variation.

We are satisfied that changes to the incineration activity will not alter the ability to comply with these monitoring requirements.

6.8 Reporting

As a result of the above changes to monitoring requirements, we have extended the reporting requirements to cover reporting of Ammonia and Nitrous oxide (N_2O) emissions.

There are no other changes to the reporting requirements set within the permit by result of this variation.

We are satisfied that changes to the incineration activity will not alter the ability to comply with these requirements.

7 Other legal requirements

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

7.1 The EPR 2016 and related Directives

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

There are no changes as a result of this variation. We are satisfied that the incineration activity will not alter the ability to comply with EPR (and related Directives).

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:

There are no changes as a result of this variation. We are satisfied there are no additional conditions that should be included as a result of this variation to take account of the Section 4 duty

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

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

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

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

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

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

(iv) Section 6(6) (Fisheries)

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

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

(v) Section 7 (Pursuit of Conservation Objectives)

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

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

(vi) Section 39 (Costs and Benefits)

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

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

(vii) Section 108 Deregulation Act 2015 – Growth duty

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit.

Paragraph 1.3 of the guidance says:

"The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation."

We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

(viii) 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).

We do not consider that the changes made by this variation will alter any impacts relating to areas of outstanding natural beauty.

7.2.4 **Wildlife and Countryside Act 1981**

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

We assessed the Application and concluded that the Installation will not damage the special features of any SSSI. This was recorded on a CROW Appendix 4 form (which was sent to Natural England on 27/07/2017).

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

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

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

7.3 National secondary legislation

7.3.1 **Conservation of Habitats and Species Regulations 2010**

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

We consulted Natural England (27/07/2017) by means of an Appendix 11 assessment for information, that the operation of the Installation would not have a likely significant effect on the interest features of protected sites.

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

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

Consideration has been given to whether any additional requirements should be imposed in terms of the Environment Agency's duty under regulation 3 to secure compliance with the requirements of the Water Framework Directive and the EQS Directive through (inter alia) environmental permits, and its obligation in regulation 17 to have regard to the river basin management plan (RBMP) approved under regulation 14 and any supplementary plans prepared under regulation 16. However, it is felt that existing conditions are sufficient in this regard and no other appropriate requirements have been identified.

7.3.3 **The Persistent Organic Pollutants Regulations 2007**

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

7.3.4 **Bathing Water Regulations 2013**

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

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

7.4 Other relevant legal requirements

7.4.1 Duty to Involve

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

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

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

IED Article	Requirement	Delivered by
45(1)(a)	The permit shall include a list of all types of waste which may be treated using at least the types of waste set out in the European Waste List established by Decision 2000/532/EC, if possible, and containing information on the quantity of each type of waste, where appropriate.	Condition 2.3.4(a) and Table S2.2 in Schedule 2 of the Permit.
45(1)(b)	The permit shall include the total waste incinerating or co-incinerating capacity of the plant.	Condition 2.3.4(a) and Table S2.2 in Schedule 2 of the Permit.
45(1)(c)	The permit shall include the limit values for emissions into air and water.	Conditions 3.1.1 and 3.1.2 and Tables S3.1 and S3.1(a) in Schedule 3 of the Permit.
45(1)(e)	The permit shall include the sampling and measurement procedures and frequencies to be used to comply with the conditions set for emissions monitoring.	Conditions 3.5.1 to 3.5.5 and Tables S3.1, S3.1(a), S3.3 and S3.4 in Schedule 3 of the Permit.
45(1)(f)	The permit shall include the maximum permissible period of unavoidable stoppages, disturbances or failures of the purification devices or the measurement devices, during which the emissions into the air and the discharges of waste water may exceed the prescribed emission limit values.	Conditions 2.3.10 and 2.3.11.
46(1)	Waste gases shall be discharged in a controlled way by means of a stack the height of which is calculated in such a way as to safeguard human health and the environment.	Condition 2.3.1(a) and Table S1.2 of Schedule 1 of the Permit.
46(2)	Emission into air shall not exceed the emission limit values set out in part of Annex VI.	Conditions 3.1.1 and 3.1.2 and Tables S3.1 and S3.1a.
46(2)	Emission into air shall not exceed the emission limit values set out in parts 4 or determined in accordance with part 4 of Annex VI.	Conditions 3.1.1 and 3.1.2 and Tables S3.1 and S3.1a.

IED Article	Requirement	Delivered by
46(3)	Relates to conditions for water discharges from the cleaning of exhaust gases.	There are no such discharges as condition 3.1.1 prohibits this.
46(4)	Relates to conditions for water discharges from the cleaning of exhaust gases.	There are no such discharges as condition 3.1.1 prohibits this.
46(5)	Prevention of unauthorised and accidental release of any polluting substances into soil, surface water or groundwater. Adequate storage capacity for contaminated rainwater run-off from the site or for contaminated water from spillage or fire-fighting.	The application explains the measures to be in place for achieving the directive requirements
46(6)	Limits the maximum period of operation when an ELV is exceeded to 4 hours uninterrupted duration in any one instance, and with a maximum cumulative limit of 60 hours per year. Limits on dust (150 mg/m3), CO and TOC not to be exceeded during this period.	Conditions 2.3.10 and 2.3.11
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 2.3.10
48(1)	Monitoring of emissions is carried out in accordance with Parts 6 and 7 of Annex VI.	Conditions 3.5.1 to 3.5.5. Reference conditions are defined in Schedule 6 of the Permit.
48(2)	Installation and functioning of the automated measurement systems shall be subject to control and to annual surveillance tests as set out in point 1 of Part 6 of Annex VI.	Condition 3.5.3, and Tables S3.1, S3.1(a), and S3.4
48(3)	The competent authority shall determine the location of sampling or measurement points to be used for monitoring of emissions.	Conditions 3.5.3 and 3.5.4
48(4)	All monitoring results shall be recorded, processed and presented in such a way as to enable the competent authority to verify compliance with the operating conditions and emission limit values which are included in the permit.	Conditions 4.1.1 and 4.1.2, and Tables S4.1 and S4.4

IED Article	Requirement	Delivered by
49	The emission limit values for air and water shall be regarded as being complied with if the conditions described in Part 8 of Annex VI are fulfilled.	Conditions 3.1.1, 3.1.2 and 3.5.5
50(1)	Slag and bottom ash to have Total Organic Carbon (TOC) < 3% or loss on ignition (LOI) < 5%.	Conditions 3.5.1 and Table S3.5
50(2)	Flue gas to be raised to a temperature of 850ºC for two seconds, as measured at representative point of the combustion chamber.	Condition 2.3.9. Pre-operational condition and Improvement condition covering this.
50(3)	At least one auxiliary burner which must not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil liquefied gas or natural gas.	Condition 2.3.8
50(4)(a)	Automatic shut to prevent waste feed if at start up until the specified temperature has been reached.	Condition 2.3.7
50(4)(b)	Automatic shut to prevent waste feed if the combustion temperature is not maintained.	Condition 2.3.7
50(4)(c)	Automatic shut to prevent waste feed if the CEMs show that ELVs are exceeded due to disturbances or failure of waste cleaning devices.	Condition 2.3.7
50(5)	Any heat generated from the process shall be recovered as far as practicable.	(a) The plant will generate electricity (b) Operator to continue reviewing the available heat recovery options every 2 years (Conditions 1.2.1 to 1.2.3) as per existing permit.
50(6)	Relates to the feeding of infectious clinical waste into the furnace.	No infectious clinical waste will be burnt
50(7)	Management of the Installation to be in the hands of a natural person who is competent to manage it.	Conditions 1.1.1 to 1.1.3 and 2.3.1 of the Permit.
51(1)	Different conditions than those laid down in Article 50(1), (2) and (3) and, as regards the temperature Article 50(4) may be	No such conditions have been allowed

IED Article	Requirement	Delivered by
	authorised, provided the other requirements of this chapter are me.	
51(2)	Changes in operating conditions do not cause more residues or residues with a higher content of organic polluting substances compared to those residues which could be expected under the conditions laid down in Articles 50(1), (2) and (3).	No such conditions have been allowed
51(3)	Changes in operating conditions shall include emission limit values for CO and TOC set out in Part 3 of Annex VI.	No such conditions have been allowed
52(1)	Take all necessary precautions concerning delivery and reception of Wastes, to prevent or minimise pollution.	Conditions 2.3.1, 2.3.3, 3.2, 3.3, 3.4 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 3 of the Permit.
52(3)	Prior to accepting hazardous waste, the operator shall collect available information about the waste for the purpose of compliance with the permit requirements specified in Article 45(2).	Not Applicable – hazardous waste is not permitted by this permit
52(4)	Prior to accepting hazardous waste, the operator shall carry out the procedures set out in Article 52(4).	Not Applicable – hazardous waste is not permitted by this permit
52(5)	Granting of exemptions from Article 52(2), (3) and (4).	Not Applicable
53(1)	Residues to be minimised in their amount and harmfulness, and recycled where appropriate.	Conditions 1.4.1, 1.4.2 and 3.5.1 with Table S3.5
53(2)	Prevent dispersal of dry residues and dust during transport and storage.	Conditions 1.4.1, 2.3.1, 2.3.2 and 3.2.1.
53(3)	Test residues for their physical and chemical characteristics and polluting potential including heavy metal content (soluble fraction).	Condition 3.5.1 and Table S3.5 and pre-operational condition.

IED Article	Requirement	Delivered by
55(1)	Application, decision and permit to be publicly available.	All documents are accessible from the Environment Agency Public Register.
55(2)	An annual report on plant operation and monitoring for all plants burning more than 2 tonne/hour waste.	Condition 4.2.2 and 4.2.3.

ANNEX 2: Pre-Operational Conditions

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

Ref	Pre-operational measures	Reason
PO1	Prior to the commencement of commissioning, the Operator shall send a summary of the site Environment Management System (EMS) to the Environment Agency detailing updates made as a result of this variation, including but not limited to Accident prevention and management. The operator shall make available for inspection all documents and procedures which form part of the EMS. The EMS shall be developed in line with the requirements set out in Environment Agency web guide on developing a management system for environmental permits (found on www.gov.uk). 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.	Requirement from existing permit
PO2	Prior to the commencement of commissioning of activity references AR4 – AR7, 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.	Requirement from existing permit
PO3	Prior to the commencement of commissioning of activity reference AR1, 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.	
PO4	At least three months before commissioning activity reference AR1, the Operator shall submit a written report to the Environment Agency specifying arrangements for continuous and periodic monitoring of emissions to air to comply with Environment Agency guidance notes M1 and M2. The report shall include the following: • Plant and equipment details, including accreditation to MCERTS • Methods and standards for sampling and analysis • Details of monitoring locations, access and working platforms	Requirement from existing permit
PO5	Prior to the commencement of commissioning activity reference AR1, the Operator shall submit to the Environment Agency for approval a protocol for the sampling and testing of incinerator bottom ash for the purposes of assessing its hazard status. Sampling and testing shall be carried out in accordance with the protocol as approved.	Requirement for new incineration activity.

PO6	After completion of furnace design and at least three calendar months before commencement of commissioning activity reference AR1, the operator shall submit a written report to the Agency of the details of the computational fluid dynamic (CFD) modelling. The report shall demonstrate whether the design combustion conditions comply with the residence time and temperature requirements as defined by Chapter IV and Annex VI of the IED.	Requirement for new incineration activity.
PO7	Prior to the commencement of commissioning of activity references AR4 – AR7, the Operator shall confirm any relevant changes to the odour management plan (as referred to within table S1.2 of this permit) and submit an updated odour management plan (where relevant) to the Environment Agency for approval.	Existing operating technique has been modified. Operator should confirm any changes
PO8	Prior to the commencement of commissioning of activity reference AR1, the Operator shall confirm details of the construction of the subsurface storage tank to the Environment Agency for approval in writing. Confirmation shall include but not be limited to containment measures of double skinned / tank reinforcement, and a leak detection system linked to the installation's control office.	Confirmation when further detail is available prior to construction commencing.

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.

Ref	Improvement measure	Reason	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.	Not provided as Installation not operational. Requirement for the new activity.	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 A5, identifying the fractions within the PM_{10}, and $PM_{2.5}$ ranges. On receipt of written approval from the Environment Agency to the proposal and the timetable, the Operator shall carry out the tests and submit to the Environment Agency a report on the results.	Requirement for new incineration activity – and also in reflection of change in Particulate emission.	Within 6 months of the completion of commissioning of activity AR1.
IC3	The Operator shall submit a written report to the Environment Agency on the commissioning of activity references AR4 – AR7. The report shall summarise the environmental performance of the plant as installed against the design parameters set out in the Application. The report shall also include a review of the performance of the facility against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions and confirm that the Environmental Management System (EMS) has been updated accordingly.	Requirement from existing permit	Within 4 months of the completion of commissioning of activity references AR4 – AR7.
IC4	The Operator shall submit a written report to the Environment Agency on the commissioning of activity reference AR1. The report shall summarise the environmental performance of the plant as installed against the design parameters set out in the Application. The report shall also include a review of the performance of the facility against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions and confirm that the Environmental Management System (EMS) has been updated accordingly.	Requirement from existing permit	Within 4 months of the completion of commissioning of activity reference AR1.
IC5	The Operator shall carry out checks to verify the residence time, minimum temperature and oxygen content of the exhaust gases in the furnace whilst operating under the anticipated most unfavourable operating conditions. The results shall be submitted in writing to the Environment Agency and include a comparison with the CFD modelling submitted by pre-operational condition PO5.	Requirement for new incineration activity.	Within 4 months of the completion of commissioning of activity reference AR1.

IC6	The Operator shall submit a written report to the Environment Agency describing the performance and optimisation of: • The Selective Non Catalytic Reduction (SNCR) system and combustion settings to minimise oxides of nitrogen (NO_x).The report shall include an assessment of the level of NO_x, N_2O and NH_3 emissions that can be achieved under optimum operating conditions. • The lime injection system for minimisation of acid gas emissions • The carbon injection system for minimisation of dioxin and heavy metal emissions.	Requirement from existing permit on how emission of oxides of nitrogen compare with the emission limit value. This condition has been amended in reflection of changes to NOx abatement by inclusion of SNCR by this variation.	Within 4 months of the completion of commissioning of activity reference AR1.
IC7	The Operator shall submit the written protocol referenced in condition 3.2.4 for the monitoring of soil and groundwater for approval by the Environment Agency. The protocol shall demonstrate how the Operator will meet the requirements of Articles 14(1)(b), 14(1)(e) and 16(2) of the IED. The procedure shall be implemented in accordance with the written approval from the Agency.	Requirement from existing permit	Within 12 months from completion of commissioning of activity reference AR1.
IC8	The Operator shall carry out an assessment of the impact of emissions to air of the following component metals subject to emission limit values : Cr(VI) and As. A report on the assessment shall be made to the Environment Agency. Emissions monitoring data obtained during the first year of operation shall be used to compare the actual emissions with those assumed in the impact assessment submitted with the Application. An assessment shall be made of the impact of each metal against the relevant environmental standard (ES). In the event that the assessment shows that an ES can be exceeded, the report shall include proposals for further investigative work.	Requirement from existing permit (CrVI).	15 months from the completion of commissioning of activity reference AR1.
IC9	The Operator shall submit a written summary report to the Environment Agency to confirm by the results of calibration and verification testing that the performance of Continuous Emission Monitors for parameters as specified in Table S3.1 and Table S3.1(a) complies with the requirements of BS EN 14181, specifically the requirements of QAL1, QAL2 and QAL3.	Requirement from existing permit	Initial calibration report to be submitted to the Agency within 3 months of completion of commissioning of activity reference AR1. Full summary evidence compliance report to be submitted within 18 months of completion of commissioning of activity reference AR1.

IC10	The Operator shall undertake a review of water usage and management throughout the site with consideration of BAT (Best Available Techniques), and provide a written report to the Environment Agency of the review. The report shall include:- • An updated water balance diagram. • A feasibility study for options to use water more efficiently within the Installation, including but not limited to, the replacement of the single pass water system with a multi-pass water system. Where efficiency measures cannot be made, the operator shall provide detailed justification (with evidence such as cost benefit analysis) for not implementing such measures. Where any improvement measures are identified, the operator shall provide a timescale for their implementation – which shall seek written approval from the Environment Agency.	The operator has requested inclusion of such improvement condition following 12 months of post-commissioning operation. At present a single pass system for boiler water is employed. The location of the Installation experiences significant water hardness - which could impact upon the plant. Operational data will allow further consideration to be made.	Within 12 months from completion of commissioning of activity reference AR1.

ANNEX 4: Consultation Reponses

A) Advertising and Consultation on the Application

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

The Application was advertised on the Environment Agency website from 06 Jun 2017 to 04 Jul 2017. The Application was made available to view at the Environment Public Register at Environment Agency's - Guildbourne House.

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

- Director of Public Health / Public Health England
- Food Standards Agency
- Health and Safety Executive
- Local Authority (planning).
- Local Authority (environmental health)
- National Grid
- Sewage Undertaker (southern water)
- Natural England

1) Consultation Responses from Statutory and Non-Statutory Bodies

Response Received from Local Authority (Planning) – Isle of Wight Council	
Brief summary of issues raised:	**Summary of action taken / how this has been covered**
we have no specific comments to make in relation to the environmental permit, however we would like to take this opportunity to draw your attention to the planning permission (our planning application reference: P/01376/15) and associated conditions related to this site..	No actions required for Environmental Permit.

Response Received from Sewage Undertaker - Southern Water	
Brief summary of issues raised:	**Summary of action taken / how this has been covered**
We confirm that we have no comments and do not wish to respond to the consultation. We are not currently aware of any application to make a trade effluent discharge in relation to this variation.	The applicant provided further clarification (after consultation was carried out on the application) for the collection and disposal of boiler blowdown / site effluent, which will be collected and removed offsite. We have included an improvement condition within the permit for the operator to review this position following a period of operation.

	If the operator considers in future that they wish to discharge to sewer, then this will be subject to separate application to vary the permit (in order to assess such request).

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

We received one consultation response - from a member of the public.

Representations from Individual Members of the Public

Brief summary of issues raised:	**Summary of action taken / how this has been covered**
1. The condenser referred to in the Supplementary Information, appears to be missing.	1. Within the application – 'process flow and mass balance' reference is made to a condensate vessel'. 2. Within the application – supplementary information it is stated that 'the plant will be equipped with a condensation steam turbine with generator set'. We required the operator to clarify this point (and the following points) within the request for additional information. The Operator provided additional information within the response (part 2) stating:- Since the variation application was submitted, additional detailed design work has been undertaken on the facility, and as such a revised water balance has been prepared. The water balance and mass flow diagram are presented as Appendix B. This detailed design work is ongoing and may amend the detail of the water cycle within the facility further. At present, it is proposed by the manufacturer to use a single pass boiler water system, however, prior to commissioning of the plant, additional work will be undertaken to determine if boiler water recirculation is viable at the site. Following determination of suitability to re-circulate water, and update on waste water management will be provided to the Environment Agency'. There will be two main losses of boiler water within the water steam cycle. i). The continuous desalination of the boiler water we have a blow down flow from the steam drum to the boiler house flash tank which is approx. 1% to 1.5% of the steam production (184 - 274 kg/h). ii). Some losses at the steam turbine (condensation steam turbine with generator set) for sealing and other issues that are only partly condensed and fed back to the system. Residual heat (from the steam turbine) will be dispersed within an air cooled condenser.

	These losses depend on the type of turbine that will be chosen and are estimated at 0,25% of the steam production or 45.8 kg/h. While the turbine losses will be disposed as vapor through the roof (93.1 kg/h), the continuous blow down of the boiler will only partly evaporate inside the flash tank (181.4 kg/h) at 100 °C. Both streams (blow down and turbine losses) have to be replaced by the demin water plant, 320,3 kg/h in total. Water treatment will be provided by a reverse osmosis plant (RO) which will have a waste water stream (concentrate) of about the same amount. The concentrate will be led to the flash tank and mixed with the liquid part of the boiler blow down water to cool down the flash tank drain water to 50-55 °C, 501.6 kg/h. This water will be collected in a pit close to the boiler flash tank. This pit serves as the reservoir to replace the water of the wet deashing systems of the incinerator and the boiler. The consumption of the wet deashing systems will be 300 kg/h minimum. The remaining waste water stream to be disposed from the pit to drainage system will be about 201,6 kg/h. We have included an improvement condition for water management to be reviewed following 12 months of post-commissioning operation. This will allow the operator to investigate the feasibility of any improvements (for which currently cannot be provided due to lack of operational data / experience of hard water issues – as present within the locality (Isle of Wight) of the facility.
2. There is an indication of zero flow from the fuel tank. How then does the process start up?	Operation of the Michaelis unit is controlled and monitored by the DCS and SCADA system, which makes the unit fully automated. These systems carry out data acquisition as well as control operations. Supplementary firing of the Michaelis unit is required during start up and shut down periods only. The combustion chamber is equipped with oil fuelled burners for this purpose, fed by an oil tank within the installation boundary. The plant needs to reach the minimum operational temperature (850°C) before waste can be fed into the system. The minimum temperature is reached through use of the burners burning fuel oil. The start up steps specific to the combustion process and associated flue gas cleaning system are as follows (simplified and disregarding plant safety checks, boiler and turbine start up requirements): I. Turn on ID-fan (safety, ensures under pressure); II. Turn on flue gas filter system / additive system (pre-coat); III. Turn on auxiliary burners; IV. Heat combustion chamber up to 850°C; V. Start waste paddle system, start feeding wastes to the plant; and VI. Start de-ashing system.

	The fuel consumption for a cold start up is around 2,000 litres of fuel oil. Shut down will require a reduced oil volume. 3. See response to point 1 above. The applicant has claimed that water hardness is providing restrictions which need further investigation once operational. The claim of high water hardness has been verified by local Environment Agency. We have included an improvement condition to cover this aspect. **4.** The response provided further clarification on energy following further design work and the energy calculations have been reviewed and revised. We are satisfied with the revised information provided. Accounting for the design stage of the process (i.e. prior to commissioning) we have included an improvement condition which requires the operator to submit a written report on the commissioning of the installation. <u>The report shall summarise the environmental performance of the plant as installed against the design parameters set out in the Application.</u>
3. The Supplementary information states (page 20) that 'there is a new proposed pre-operational condition relating to the storage and transfer off site of boiler blow down and waste process water. The applicant's response to BAT 33 suggests that a condenser is planned. 4. There is lack of clarity as to the applicant's intentions, notwithstanding which the energy recovery performance claimed (21%) appears to assume the inclusion of a condenser. <u>The Supplementary Information</u> There are certain discrepancies between this document and the information shown in Annex 2. The principal one relates to input energy, shown as 224,770 MWh/annum which has to be compared with annual operating hours (7800) X gross output (3.5 MW) = 27300 MWh/year in the supplementary information or 3.7Mw [28860MWh / annum] from Annex 2. Whilst the annual input energy is given as 22,4770 MWh/year although at 5 tonnes / hour and a CV of 11.7 Mj/kg (= 3.25 MWh/tonne), this equates to 126,851MWh/year.	

There would seem to be have been only a superficial, if that, check on the integrity of the application documents.	
Annex 3 : The applicant appears to imply that the BATs 1–15 in the Waste Incineration BREF are not applicable to the incineration installation for which a Permit is being sought. To me this suggests a contempt for the BREF and the Environment Agency and I can see no justification for the position taken by the applicant.	We required the operator to clarify BAT points missing from within the application. This has been provided within (part 2) of the Schedule 5 Response.
Annex 4: The dispersion plots and the sensitive receptors are plotted on maps of dubious origin, unscaled and endorsed 'do not scale'. This is not acceptable. The applicant should be required to present this information on OS 1: 50,000 maps.	We have assessed the applicant's dispersion modelling. We are satisfied that the plans that we submitted were sufficient for us to assess the impacts of the installation. A change of maps / scale would not alter the outcome of this decision, or the outcome of our assessment of air dispersion impacts.
Michaelis technology (the moved bed system): This does not appear to correspond to any of the incinerator grate characteristics recognised as BATs in the 2006 Waste Incineration BREF or indeed in its draft replacement. As a result, and whilst the EA will not wish, without good reason, to discourage innovation, the proposed incinerator should be considered as representing a significant environmental risk at a location that has already suffered from defective incineration technology.	The applicant has provided further information by schedule 5 notice. This includes further information on the technology, further appraisal of BAT, and evidence of operational plants – three of which are located within the European Union nations and required to operate within the requirements of Annex VI of the IED. We are satisfied with the data provided. The Incinerator will be required to operate within the conditions of the permit.

Decision checklist

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Identifying confidential information	We have not identified information provided as part of the application that we consider to be confidential.
Consultation/Engagement	
Consultation	The consultation requirements were identified in accordance with the Environmental Permitting Regulations and our public participation statement. The application was publicised on the GOV.UK website. . We consulted the following organisations: • Director of Public Health / Public Health England • Food Standards Agency • Health and Safety Executive • Local Authority (planning). • Local Authority (environmental health) • National Grid • Sewage Undertaker (southern water) • Natural England The comments and our responses are summarised in the consultation section of this document.
The facility	
The regulated facility	We considered the extent and nature of the facility at the site in accordance with RGN2 'Understanding the meaning of regulated facility', Appendix 2 of RGN 2 'Defining the scope of the installation', Appendix 1 of RGN 2 'Interpretation of Schedule 1', guidance on waste recovery plans and permits. The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.
The site	
Extent of the site of the facility	**The site plan has not changed as a result of this variation.** The operator has provided a plan which we consider is satisfactory, showing the extent of the site of the facility. The plan is included in the permit.
Site condition report	The operator has provided a description of the condition of this existing site, which we consider is satisfactory. The decision was taken in accordance with our guidance on site condition reports and baseline reporting under the Industrial Emissions Directive.

<table>
<tr><th>Aspect considered</th><th>Decision</th></tr>
<tr><td></td><td>We have considered changes to potentially polluting substances stored on site (including urea and boiler blowdown) and the associated prevention measures. Further information is contained within Key Issues of this document.</td></tr>
<tr><td>Deposit for recovery</td><td>There are no changes to the existing waste operations permitted.</td></tr>
<tr><td>Biodiversity, heritage, landscape and nature conservation</td><td>The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat.

<u>Relevant sites within 10km (screening) : European Sites</u>
<table>
<tr><td>South Wight Maritime</td><td>SAC</td></tr>
<tr><td>Briddlesford Copses</td><td>SAC</td></tr>
<tr><td>Solent Maritime</td><td>SAC</td></tr>
<tr><td>Isle of Wight Downs</td><td>SAC</td></tr>
<tr><td>Solent & Southampton Water</td><td>Ramsar</td></tr>
<tr><td>Solent & Southampton Water</td><td>Proposed SPA</td></tr>
</table>
<u>Relevant sites within 2km (screening)</u>
<table>
<tr><td>SSSI</td><td>Parkhurst Forest</td></tr>
<tr><td rowspan="5">LWS</td><td>Parkhurst Forest</td></tr>
<tr><td>Alvington Manor Chalk Pit</td></tr>
<tr><td>Rodge Brook Scrubs</td></tr>
<tr><td>Noke Plantation</td></tr>
<tr><td>Kitbridge Farm</td></tr>
</table>
We have assessed the application and its potential to affect all known sites of nature conservation, landscape and heritage and/or protected species or habitats identified in the nature conservation screening report as part of the permitting process.

We consider that the application will not affect any sites of nature conservation, landscape and heritage, and/or protected species or habitats identified.

We sent completed Appendix 4 and Appendix 11 assessments to Natural England for information. The decision was taken in accordance with our guidance.</td></tr>
<tr><td colspan="2">Environmental risk assessment</td></tr>
<tr><td>Environmental risk</td><td>We have reviewed the operator's assessment of the environmental risk from the facility.

The operator’s risk assessment is satisfactory. Section 5 of this document details this.</td></tr>
</table>

Operating techniques	
General operating techniques	We have reviewed the techniques stated within the application / further information and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility. *We have amended the existing operating technique "*Application documents: received 12/02/16" in order to exclude references to the previous gasification plant. The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit.
Odour management	We have previously reviewed the odour management plan for the facility - in accordance with our guidance on odour management, and consider that this remains satisfactory for the purpose of this variation. We have included a pre-operational condition (PO6) which requires the operator to update the existing odour management plan (as referred to within table S1.2 of the permit) to account for any changes which might be required.
Noise management	We have previously reviewed the noise management plan in accordance with our guidance on noise assessment and control. We considered that the noise management plan was satisfactory. A revised noise assessment (for this change in technology) was provided with the application (appendix 5). The assessment covered both construction and operational noise (being used to support non-material amendments to the planning permission). The assessment reached the same conclusions as that of the original noise assessment concluding noise levels to not materially depart from those originally assessed, and confirming that these comply with values assessed within the original noise assessment. We are satisfied that this variation will not add additional noise, and will remain within the operating envelope of the current assessment – as already assessed.
Fire prevention plan	We have previously assessed and approved the fire prevention plan as part of variation EPR/QP3337ADV002 and are satisfied that it meets the measures and objectives set out in the Fire Prevention Plan guidance. There are no permitted changes to waste types or waste quantities as a result of this variation.
Permit conditions	
Updating permit conditions during consolidation	We recently updated the permit conditions during the determination of application EPR/QP3337AD/V002 to those in the current generic permit template as part of permit consolidation.
Raw materials	We have specified limits and controls on the use of raw materials and fuels. Changes to raw materials by this variation related to :- - **Urea** (which is introduced to the site for use within the SNCR system to reduce NOx emissions). *The Application confirms a maximum storage of 20*

	tonnes at any one time, *with maximum annual usage of 273m³. Urea is stored in a tank – internal to the TT building.* The operator is required to report raw material usage by existing permit. We have amended this requirement to include Urea.
Waste types	There are no changes to the existing waste types or quantities permitted through this permit.
Pre-operational conditions	Based on the information in the application, we consider that we need to impose pre-operational conditions. Justification for these is detailed within Annex 2 of this document.
Improvement programme	Based on the information on the application, we consider that we need to impose an improvement programme. Justification for these is detailed within Annex 3 of this document.
Emission limits	This is an existing permit which is being varied by application from the Operator. We have included details of relevant ELVs from the original permit, variation (V002) and this variation (V003) within section 5 of this document. Largely, ELVs will remain unchanged apart from :- • Hydrogen Chloride [20 mg/m³ to 10 mg/m³]. The applicant modelled impacts at 10 mg/m³ within the application. • Carbon Monoxide [Originally 150 mg/m³ (but reduced to 100 mg/m³ during V002)] will resume back to the limit of 150 mg/m³. This is not a change / increase to the permitted concentration, but instead from a selection of the choice of options available by IED. (IED gives a choice of 100 mg/m³ as ½ average or 150 mg/m³ as 95%ile of 10 min averages). The variation has assessed impacts at 150 mg/m³ according to the concentration authorised within the original permit). We have included an additional emission limit value for Ammonia. This is because this variation introduces SCNR for NOx abatement. • Ammonia [new limit of 20 mg/m³] *with a footnote that such limit is subject to change following the completion of improvement condition IC5.* This limit should allow some headroom between Limit and anticipated operational concentration. This limit has been included within the permit in order to ensure that the impact from these emissions are minimised. This is detailed within sections 5.2.2 and 5.4.4 of this document. The operator has based predictions upon a long term release concentration of 8.8 mg/m³.
Monitoring	We have retained existing monitoring requirements, with the requirement to monitor the following additional parameters as a result of operating an SNCR abatement system. • Ammonia • Nitrous Oxide (N_2O)

	The operator has confirmed that continuous monitoring (CEMs) will be employed for these parameters. We have also required the operator to monitor reagent use (which will now include Urea for the SNCR system).
Reporting	We have added urea (reagent usage) reporting in the permit as stated above.
Considerations of foul sewer	There are no process effluent discharges permitted to sewer through this permit.
Operator competence	
Management system	There is no known reason to consider that the operator will not have the management system to enable it to comply with the permit conditions. The management system for the site meets the Environment Agency guidance set out in 'Develop a management system: environmental permits'. The details remain the same as previously provided for permit EPR/QP3337AD/V002.
Financial competence	There is no known reason to consider that the operator will not be financially able to comply with the permit conditions.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit. Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.