Wealden Works 3Rs Permit Variation Application

Application to Vary Permit Reference EPR/CB3308TD

Britaniacrest Recycling Limited

JER8584
Wealden Works 3Rs Permit
Variation Application
3
2
12 October 2020

rpsgroup.com

Quality Management					
Version	**Revision**	**Authored by**	**Reviewed by**	**Approved by**	**Date**
1	0	Alice Gibbs			21 August 2020
1	1	Alice Gibbs	Jennifer Stringer		1 September 2020
1	2	Alice Gibbs	Jennifer Stringer		3 September 2020
2	1	Alice Gibbs	Keith Riley		4 September 2020
2	2	Alice Gibbs	Jennifer Stringer	Jennifer Stringer	29 September 2020
3	1	Alice Gibbs	Keith Riley	n/a	12 October 2020
3	2	Alice Gibbs	Jennifer Stringer	Jennifer Stringer	12 October 2020

Approval for issue			
Jennifer Stringer	Technical Director		12 October 2020

File Name
201012 R JER8584 AG Wealden Works 3Rs Permit Application V3 R2

Prepared by:	Prepared for:
RPS	**Britaniacrest Recycling Limited**
Alice Gibbs	
Environmental Consultant	
6-7 Lovers Walk Brighton, East Sussex BN1 6AH	
T	
E	

NON-TECHNICAL SUMMARY

Introduction

This document forms the application to vary the permit for Wealden Works Recycling, Recovery and Renewable energy (3Rs) facility for the environmental permit with reference EPR/CB3308TD under the Environmental Permitting Regulations 2016 (as amended). The applicant and operator of the Wealden Works 3Rs is Britaniacrest Recycling Limited (‘Britaniacrest’).

The Wealden Works 3Rs facility will comprise the existing waste transfer station (WTS) activities, mechanical sorting and materials recovery (MSMR) of waste and a single-line energy recovery facility (ERF). The ERF will burn fuel comprised of treated waste fractions and consequently will be subject to the requirements of the Industrial Emissions Directive, 2010. The ERF has been designed and will be operated to ensure compliance with all relevant requirements of this Directive.

This Non-Technical Summary provides a brief overview of the proposals subject to this application.

Site Location

The site is located at the former Wealden Brickworks site off Langhurstwood Road, approximately 900 metres to the north west of Horsham and 1.3 km to the north east of the centre of Warnham. The site lies within the administrative areas of West Sussex County Council and Horsham District Council. A location plan is provided in Drawing 1.

Process Description

Security of power supply is a major concern to energy intensive industries. With conventional fossil fuel supplies in decline operators are seeking to secure future energy supply from alternative means through fuel diversification. The proposals for the ERF 3Rs facility are being developed for this specific purpose.

The materials to be accepted to the Wealden Works 3Rs facility will comprise hazardous and non-hazardous waste materials, which will be delivered either straight to the ERF bunker or to the waste processing hall for sorting.

The waste throughput of the total activity (WTS, MSMR and ERF) at the Wealden Works 3Rs facility will be up to 230,000 tonnes per annum.

The ERF comprises a single processing line with an approx. 80 megawatt thermal input boiler that will generate steam. Electricity will be generated using a single turbine and the generated electricity will be exported to the grid.

All waste will be delivered by road and will be weighed prior to entry to the site. Waste acceptance procedures will be in place to ensure that it conforms to those materials which the Wealden Works 3Rs facility is designed to accept. On arrival vehicles delivering waste will either be directed to the WTS and MSMR areas or to the ERF waste bunker to off load.

Waste to be processed in the WTS and MSMR will be delivered and stored in the mechanical treatment area of the Waste Processing Hall. The waste activities will consist of simple sorting and treatment of the incoming wastes to segregate recyclable and non-burnable materials with the residual waste being combusted by the ERF. Recovered, inert and unsuitable materials will be exported for further treatment or disposal off site. There will be no change to the types of activities permitted for the WTS as a result of this variation. The waste processing area will contain the following:

- a pile area accessible by a 360-mobile plant;
- a shredder
- a screen
- over band magnet
- eddy current separator
- mobile plant – 360, forklift truck, shovel and/or telehandlers

Waste deliveries intended for the ERF will be discharged directly into the waste bunker which has a capacity equating to approximately 2,900 tonnes of waste material. Residual waste from the MSMR processing will be transferred into the bunker from the Waste Processing Hall floor.

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

Moving grate technology will be used for burning the waste material. The grate is designed as a single line sliding grate and is longitudinally inclined.

The combustion stage will be automatically controlled to ensure optimum destruction of pollutants and minimum waste generation.

Primary combustion air will be fed into the furnace through the underside of the grates by a primary air fan. Secondary air will also be injected at high velocity through nozzles positioned in the walls of the combustion chamber above the level of the waste. This will create turbulence, which assists mixing of secondary air and combustion gases to achieve complete combustion of the gases. The volume of both primary and secondary air will be regulated by the combustion control system.

Selective Non-Catalytic Reduction involving the injection of ammonium hydroxide or urea above the furnace is used to control nitrogen oxide releases in the flue gases. This system of controlling nitrogen oxides is widely applied at other similar facilities and it is considered well proven in controlling emissions below the levels within the Industrial Emissions Directive and Waste Incineration BAT Conclusions (2019).

Hot gases from the furnace will pass from the furnace into the boiler section where steam will be raised. The boiler design has been selected to minimise the synthesis of dioxins and furans.

Steam raised in the boiler will usually be passed to a single turbine to generate electricity which will be exported to the local distribution grid.

The ERF includes abatement to ensure that releases to air are controlled below the limits specified within the Industrial Emissions Directive. In addition to the use of selective non-catalytic reduction (see above), the following flue gas treatment plant is provided:

- Dry sorption reactor including both hydrated lime and activated carbon injection; and
- Fabric bag filter.

Bottom ash is generated from the furnace grate. The bottom ash is collected at the end of the grate in the water filled bottom ash extractor located beneath the grate, where this material is quenched.

The residues of the bag filter and the reactor (APC residues) are collected and directed to a residue silo. The residue silo is designed to discharge product via an enclosed loading chute into trucks or to pass through a mixing unit where water is added prior to disposal.

Clean flue gases exiting the abatement system will be discharged through a 95 m stack. This height has been selected to give optimum dispersion for the proposed plant configuration.

The abatement plant cannot be bypassed and will be in operation at all times, including start-up and shutdown.

A fundamental requirement of the Industrial Emissions Directive (Article 50 (4)) is that incineration facilities have in place an automatic system which prevents waste material feed (other than auxiliary fuel) in the following situations:

- at start up until a temperature of 850°C has been reached;
- whenever the temperature of 850°C is not maintained;
- whenever the continuous emission monitors show that any emission limit value is exceeded due to disturbance or failure of the purification devices.

For the ERF back up burners fuelled by light fuel oil (gas oil) are located above the grate. The burners will be automatically triggered to ensure that the minimum temperature of 850°C is maintained.

The detailed plant design process will include computational fluid dynamic modelling of the furnace to demonstrate that the temperature and residence time requirements specified in the Industrial Emissions Directive will be met.

The ERF has been designed to minimise freshwater consumption. This is achieved by maximising the re-use of process waters. Under normal operation there will be no process water discharges.

All plant areas will be surfaced to an appropriate standard for the activities within that area. There will be limited liquids stored on site (fuel oil, boiler water treatment chemicals and maintenance oils) and all liquid tanks and drums will be provided within adequate bunding in line with industry best practice standards (i.e. sized to contain 110% of the tank contents and include blind drains). Materials selected for surfacing of process areas and bunds will be resistant to the materials they may come into contact with.

There will be no direct discharges to groundwater from the Wealden Works 3Rs facility.

Odour problems are not expected from the Wealden Works 3Rs facility. Any potential odours from storage of the waste materials will be extracted from above the storage bunker and used as combustion air within the furnace, thereby destroying any potentially odorous compounds. In the event of a full plant shutdown, waste volumes will be run down prior to the shutdown to minimise the amounts of material remaining in the bunker. Where possible, the shutdown will be timed to coincide with periods where the Wealden Works 3Rs waste deliveries can be minimised. Doors to the waste processing hall will remain closed at all times other than for access, which will be made via fast acting roller shutters.

An environmental management system will be established in accordance with the requirements of the ISO14001 standard. The environmental management system will be combined with both the quality and health and safety management system to form an integrated management system.

An inventory of raw materials will be implemented and maintained throughout the operational life of the Wealden Works 3Rs facility. The principal raw materials will be the incoming waste materials; in addition, the following reagents will be used:

- urea/ammonium hydroxide
- hydrated lime
- activated carbon
- light fuel oil / gas oil
- water
- boiler water treatment chemicals.

Use of reagents will be optimised during commissioning and controlled during operation.

The main solid residues produced by the Wealden Works 3Rs facility will be:

- bottom ash;
- air pollution control residues;
- wood;
- metals;
- PVC
- inert materials; and
- oversized materials.

Bottom ash will be sent off site to be treated or disposed of by a third-party bottom ash processor. Air pollution control residues will be combined with fly ash and these will also be transferred off site for treatment or disposal. Wood, inerts and metals will be sent off site for recycling/recovery. The oversized materials will also be transferred off site to a suitable disposal/recovery facility.

The design of the ERF accommodates combined heat and power technology and minimises the use of fossil fuels by combusting materials derived from wastes. The ERF is designed to minimise internal energy demand thereby maximising the amount of heat and power available for export.

The ERF has been designed for safe operation both under normal, abnormal and emergency conditions. The design process will be subject to a hazard study process which aims to remove hazards through the plant design where possible. Prior to operation an updated accident management plan will be in place and this system will be reviewed and maintained.

A noise assessment has been carried out for the Wealden Works 3Rs facility. The results of the assessment indicate that significant adverse noise or vibration effects would not be expected as a result of operating the facility.

Discharges to air will be monitored and reported using continuous monitoring equipment supported by periodic stack monitoring. All monitoring will meet the requirements of the Industrial Emissions Directive and Waste Incineration Best Available Techniques (BAT) conclusions.

Process control systems will be included to provide process monitoring to ensure that the ERF is controlled within the design parameters.

The quantity of wastes generated from the Wealden Works 3Rs facility will be monitored. Further monitoring and reporting of bottom ash and air pollution control residues will be carried out in accordance with the requirements of the environmental permit.

Where available for monitoring parameters, equipment certified to the Environment Agency monitoring standard will be used to carry out monitoring at the ERF.

A full description of the site conditions at the time of this application are provided in the Site Condition and Baseline Report, which provides a coherent record of the site and baselines the site relative to relevant hazardous substances.

A site closure plan will be developed in order to demonstrate that the Wealden Works 3Rs facility will, once it has reached the end of its operational lifetime, be decommissioned to avoid any pollution risk and return the site of operation to its original condition at the time of the commencing operation in accordance with the requirements of the Environmental Permitting regime. A range of appropriate measures will be adopted during operation to ensure that the requirements for site restoration following decommissioning will be minimised.

Assessments of air quality effects and human health risk have been undertaken and concluded that no significant effects will arise as a result of operation of the ERF. A separate air quality assessment considered effects at sensitive ecological sites and also concluded that no significant effects would occur.

In summary, the Wealden Works 3Rs facility will be designed and operated to ensure that significant impacts will not arise as a result of its operation. The main plant will operate techniques that are proven and reliable and for the selected site are concluded to represent Best Available Techniques.

Contents

Tables

Drawings

Appendices

1 INTRODUCTION

1.1 Application Overview

1.1.1 This document forms the supporting statement for an application to vary Environmental Permit reference EPR/CB3308TD for the Former Wealden Brickworks Waste Transfer Station to incorporate a recycling, recovery and renewable energy (3Rs) facility, known as the Wealden Works 3Rs Facility, under the Environmental Permitting Regulations 2016 (as amended)[1].

1.1.2 The Wealden Works 3Rs Facility will comprise the existing waste transfer station (WTS) activities, mechanical sorting and materials recovery (MSMR) of waste, and a single-line energy recovery facility (ERF). The MSMR will include shredding, screening, sorting and separation.

1.1.3 The Facility will receive up to 230,000 tpa of mixed non-hazardous waste. The ERF will have a design point of 24 tonnes per hour of non-hazardous waste with a net calorific value (NCV) of 11.5 MJ/kg and convert this to both heat and electrical power. The ERF will comprise one moving grate line with a thermal input capacity of 76.7 MW. The design envelope for the ERF is shown in the combustion (stoker) diagram as Drawing 4.

1.1.4 The facility will be designed and operated to meet all requirements of the Industrial Emissions Directive 2010 (IED)[2], Waste Incineration BAT conclusions 2019[3] and EPR 5.01[4] and will use proven, reliable techniques for both the combustion of the waste materials and for the minimisation and control of releases to the environment.

1.2 Site Location

1.2.1 The Site is located at the former Wealden Brickworks site off Langhurstwood Road, approximately 900 metres to the north west of Horsham and 1.3 km to the north east of the centre of Warnham. The site lies within the administrative areas of West Sussex County Council and Horsham District Council.

1.2.2 The National Grid reference for the site is TQ 17122 34331.

1.2.3 The Site is accessed from a private shared estate road, which connects to the public highway of Langhurstwood Road. Langhurstwood Road links directly to the A264 approximately 750 m to the south.

1.2.4 The Site, as defined by the site boundary, comprises approximately 3.8 hectares (ha) of land within the former Warnham and Wealden Brickworks site, a 24.4 ha site. The site includes a large building formerly housing brick kilns, currently in use as a Waste Transfer Station/Materials Recycling Facility, surrounded by hardstanding and several smaller buildings.

1.2.5 The southern boundary of the Site is defined by the internal access road, beyond which lies the Weinerberger brickworks factory (also known as Warnham Brickworks). The London-Horsham railway line lies immediately to the west of the Site, beyond which there are mature tree belts and

---

[1] The Environmental Permitting (England and Wales) Regulations, 2016.

[2] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0075&from=EN

[3] Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019D2010&from=EN

[4] The Incineration of Waste (EPR 5.01), March 2009, Environment Agency.

open countryside. The Warnham train station is located on the London-Horsham (via Dorking & Sutton) line approximately 300 m south of the Site.

1.2.6 The eastern boundary of the Site is defined by an internal access road, beyond which lies the Brookhurst Wood Mechanical and Biological Treatment (MBT) Facility, which is operated by Biffa under contract with West Sussex County Council. The MBT Facility commenced receiving waste in 2014 and covers approximately 5.6 ha of land. To the north of the MBT Facility lies an ecological habitat area, which has been established in accordance with Condition 8 of the planning permission for the MBT Facility.

1.2.7 Two ponds are located within dense scrub to the immediate north of the Site, surrounded by grey willow, hawthorn and blackthorn.

1.2.8 The land to the immediate north and beyond the ponds is currently vacant and comprises several derelict former brickworks buildings.

1.2.9 Approximately 315 m to the north of the Site boundary is located an Aggregate Treatment and Recycling Facility (ATRF). Further north and east of the ATRF is the recently active Brookhurst Wood Landfill Site, which covers an area of approximately 34 ha. The landfill had planning permission to receive waste until the end of 2016. However, a further planning application to extend the end date for landfilling by 24 months to December 2018, as well as to extend the date for completion of restoration of the landfill from December 2017 until December 2023 has been approved. A leachate treatment plant and gas management compound, site office, store and car park is located between the ATRF and the landfill.

1.2.10 The following sensitive land uses have been identified within 1 km of the site:

- Warnham Site of Special Scientific Interest (SSSI) 620 m north east of the site.
- Warnham Local Nature Reserve (LNR) 950 m south of the site.

1.2.11 In addition to these designated sites there are 29 ancient woodland sites recorded within 1 km of the site.

1.2.12 A location plan is provided in Drawing 1 and a layout plan is provided in Drawing 2, which also indicates the permit boundary. There will be no change to the permit boundary as a result of this variation application.

1.3 The Applicant

1.3.1 The applicant is Britaniacrest Recycling Ltd, abbreviated to Britaniacrest within this document.

1.3.2 The directors and their respective dates of birth as listed on Companies House are provided in Appendix L.

1.4 Structure of the Permit Application

1.4.1 This section provides an overview of the proposals. This is supplemented by further details in Sections 2-5 as follows:

- Section 2 details the proposed management practices which will be in place at the Wealden Works 3Rs facility with specific detail relating to:
  - Accident Management;
  - Energy Efficiency;
  - Efficient use of raw materials and water;
  - Avoidance, recovery and disposal of wastes.
- Section 3 addresses the operational measures which will be in place to prevent and/or control the environmental effects of the proposals;

- Section 4 identifies the nature of emissions from the Wealden Works 3Rs facility and details the monitoring systems which will be in place.
- Section 5 summarises the conclusions from the detailed assessments undertaken to predict the environmental effects from the Wealden 3Rs facility.
- Section 6 summarises the outcome of the detailed assessments of Best Available Techniques for the key plant and abatement systems proposed.

1.5 Project Description

1.5.1 The Wealden Works 3Rs facility will include the following activities:

- Receipt and storage of non-hazardous and hazardous waste;
- Physical treatment of waste (i.e. shredding, screening, sorting and separation);
- Storage of recyclable and residual wastes;
- A single line waste Section 5.1 Part A(1)(b) incineration plant (ERF) processing incoming waste delivered to the facility by road;
- Generation of power for export to the local distribution network and heat for potential export to local heat users;
- Standby electrical generation;
- Storage of raw materials (fuel oil, hydrated lime, powdered activated carbon, water treatment chemicals, maintenance oils and greases, gases in cylinders)
- Demineralisation of mains water;
- Production of inert bottom ash material that will be transferred off-Site to a suitably licensed processing facility for recovery or disposal;
- Production of an air pollution control (APC) residue that will be transferred off-Site to a suitably licensed hazardous waste facility for disposal or recovery.

1.5.2 The WTS and MSMR will include the following recovery and disposal activities:

- R1: Use principally as a fuel or other means to generate energy
- R3: Recycling/reclamation of organic substances which are not used as solvents
- R4: Recycling/reclamation of metals and metal compounds
- R5: Recycling/reclamation of other inorganic compounds
- R13: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on site where it is produced)
- D15: Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where the waste is produced)

1.5.3 As the WTS and MSMR include both recovery and disposal activities, they do not fall under the definition of a Section 5.4 Part A(1)(a)(ii) activity, which covers only disposal activities, nor do they fall under the definition of a Section 5.4 Part A(1)(b) activity, which does not include physico-chemical treatment. During the pre-application discussions the EA confirmed that the WTS and MSMR activities do not constitute pre-treatment for incineration or co-incineration.

1.5.4 The ERF will comprise a single line facility capable of processing up to 230,000 tonnes of waste per annum, with a generating capacity of up to 24.4 MWe. Some of the waste delivered to the site will be sorted and bulked for export from the Site. The ERF will combust the rest of the waste imported to the site to generate hot gases that in turn are used to produce steam and ultimately electricity.

1.5.5 A layout plan for the proposed facility is provided in Drawing 2 and a flow diagram of the process is provided in Drawing 9.

2 MANAGEMENT OF ACTIVITIES

2.1 General

2.1.1 Britaniacrest holds certification to ISO 9001:2015, ISO 14001:2015, OHSAS 45001:2018 and registration as an upper tier waste carrier, broker and dealer. To comply with this certification, Britaniacrest maintains an Integrated Management System (IMS) at the existing site. Copies of the policies, respective certificates and extracts from its Management System documents are presented in Appendix Q.

2.1.2 The existing management system will be reviewed and amended to reflect the activities that Britaniacrest seek to permit via this variation and the plant will be operated in accordance with the updated EMS. Documented procedures will detail specifically how each activity is to be controlled.

2.1.3 The scope of the ISO 14001 certification will subsequently be extended to cover the revised permitted activities.

2.1.4 Prior to commencing commissioning on waste, all updated procedures will be in place.

2.1.5 Britaniacrest will subcontract the day-to-day operation of the ERF to a qualified and experienced third-party organisation through an operation and maintenance (O&M) contract. Britaniacrest will ensure that under the O&M contract Britaniacrest retains control of the 3Rs Facility and it is operated to the exact instruction of Britaniacrest.

2.1.6 Britaniacrest will require the O&M contractor to implement environmental management systems in accordance with BS EN ISO 14001:2015 Environmental Management System Standard and with the operating and maintenance instructions of the designer of the plant. It will ensure that the O&M contractor will develop an EMS that clearly defines the management structure as well a setting out roles and responsibilities of all staff. The development of the EMS will also include:

- An Environmental Policy;
- Health and Safety Procedures; and
- An operating guidance manual which will include process plant operating procedures for both standard and emergency conditions.

2.1.7 Where applicable, documented procedures will detail specifically how each activity is to be controlled. These will be contained in the Environmental Procedures Manual and identified related documents.

2.1.8 The Construction (Design and Management) Regulations will apply during the construction and commissioning period and during major equipment replacement during operation. In addition, management will undertake inspections and reviews for quality control, performance measurements, and staff appraisals.

Operations and Maintenance

2.1.9 Britaniacrest will ensure that the operation of the Wealden Works 3Rs facility will comply with industry standards or codes of practice for training (e.g. WAMITAB and EU Skills, as appropriate).

2.1.10 Procedures will be in place to ensure that all operations which have the potential to give rise to significant environmental effects are controlled. Procedures will not only cover normal operation but will also address abnormal operation, including start-up and shutdown. Planned maintenance routines will be established to ensure all key plant components which have the potential to affect the environmental performance of the Wealden Works 3Rs Facility remain in good working order. Maintenance routines will draw on manufacturer recommendations, unless operational experience during the lifetime of the Wealden Works 3Rs Facility would indicate the need for variance.

2.1.11 In particular procedures will be in place prior to operation in relation to the following:

- waste reception and handling, including waste acceptance procedures – these will include updated systems for ensuring waste is subjected to the correct treatment (i.e. MSMR or ERF) and mechanisms for recording tracking of waste through the facility;
- control of the combustion process and waste treatment activities, to ensure good combustion is achieved and compliance with IED and BAT conclusions requirements;
- operation of the flue gas cleaning systems; and
- storage, handling and removal of wastes from the site.

Competence and Training

2.1.12 Procedures will be in place to identify the minimum competencies required for each operational role on the site. These will then be applied to the recruitment and training processes of both Britaniacrest and its contractors to ensure that staff possess the competencies required. Staff training will be carried out by the plant supplier during commissioning of the plant before the Wealden Works 3Rs facility is fully operational. Training will not only address normal operations but will also include those actions required in the event of abnormal operations and emergencies.

2.1.13 Managers will identify and monitor staff training needs as part of the on-going appraisal system. Job specifications will be defined and will include details on relevant qualifications required. Personnel records will record what training is required (whether this be classroom-based or on the job training). The training needs of employees will be addressed using on-the-job training, mentoring, internal training and external training courses/events and will include “refresher” training as required.

2.1.14 Procedures will be in place to ensure that contractors undertaking work at the installation are qualified for the task they are undertaking, enforced through conditions of contract.

2.1.15 All relevant staff and contractors constructing, commissioning or operating the Facility will be made aware of the requirements of the permit, in particular those conditions that relate to emission limits and notification procedures. A copy of the permit will be available for reference within the Control Room.

2.1.16 Training programmes will be developed to make employees aware of:

- The importance of conformity with the environment policies and procedures and with the requirements of the EMS;
- Significant environmental aspects associated with their work;
- Their roles and responsibilities in achieving conformity with the requirements of the EMS, including emergency preparedness and response requirements;
- The relevance and importance of their activities and how they contribute to the achievement of the environmental and quality objectives; and
- The potential consequences of the departure from specified procedures.

2.1.17 Records of training will be stored and maintained. Records as a minimum will include details relating to the date, type of training and training provider. The EMS will contain an archiving procedure to ensure all training is recorded and all associated records are retained. Training records will be maintained onsite. The operation of the Wealden Works 3Rs Facility will comply with the relevant industry standards or codes of practice for training (e.g. WAMITAB or E&U Skills), where they exist.

Organisation

2.1.18 An organisation chart for the Wealden Works 3Rs facility is provided in Drawing 8 and indicates the main lines of responsibility. Roles and responsibilities will be clearly defined within the management system.

2.1.19 The key environmental management responsibilities will be allocated as follows:

- A General Manager will have overall responsibility for management of the Wealden Works 3Rs facility and compliance with the operating permit. The General Manager will have extensive experience relevant to his responsibilities.
- An Operations Manager will have day-to-day responsibility for the operation of the plant, to ensure that the plant is operated in accordance with the permit and that the environmental impact of the plant's operations is minimised. In this context, they will be responsible for designing and implementing operating procedures which incorporate environmental aspects.
- A Maintenance Manager will be responsible for the management of maintenance activities, for maintenance planning and for ensuring that the plant continues to operate in accordance with its design.

2.1.20 Further details on specific aspects of the management systems for the Wealden Works 3Rs are provided in the following sections of this document.

2.2 Accident Management

2.2.1 An accident management plan (AMP) will be established prior to commencing operation of the proposed Wealden Works 3Rs Facility. Procedures to follow in the event of an emergency or accident/incident will be in place prior to burning waste. This will include small incidents such as minor spills and leaks and complaints as well as major incidents such as a fire or explosion. In particular a procedure including a system for recording and allocating appropriate follow-up for accidents, incidents and non-conformances.

2.2.2 The AMP will be consistent with similar plans already in place for the existing permitted activities.

2.2.3 To support this application an initial environmental risk assessment is provided in Appendix D, which was carried out in accordance with EA guidance[5,6]. This will be reviewed prior to commencing operation and maintained as part of the AMP throughout the operational life of the Wealden Works 3Rs facility.

2.2.4 As part of the design process the proposals will be subject to detailed HAZOP/HAZID with a view to designing out safety, health and environmental risks.

Abnormal Operation

2.2.5 Articles 46 and 50 of the IED set out specific requirements covering abnormal operating conditions. The Operator will ensure that the Wealden Works 3Rs Facility will not exceed the maximum permissible period of any technically unavoidable stoppages, disturbances or failures of the abatement plant or monitoring systems. In particular, unless stricter timescales are set within the permit, the Wealden Works 3Rs Facility shall not continue operation for more than four hours uninterrupted where emission limit values are exceeded and moreover, the cumulative duration of operation over 1 year shall not exceed 60 hours. An air quality assessment of emissions during abnormal operations has been undertaken and is included in Appendix K. The assessment concluded that under abnormal operations, all air quality impacts are considered to have an insignificant effect.

2.2.6 Systems will be established for recording the duration of any such event and calculating the cumulative duration such that compliance with the permit can be demonstrated. Where any

[5] Risk assessments for your environmental permit, 1st February 2016, Environment Agency. Available online: https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit

[6] Air emissions risk assessment for your environmental permit, 1st February 2016, Environment Agency. Available online: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

incident or cumulative duration will exceed the maximum permitted time period the Wealden Works 3Rs facility will be shut down as soon as practicable.

2.2.7 The Wealden Works 3Rs facility has been designed and will be operated to ensure that at all times when waste is being burned a temperature in excess of 850°C for at least 2 seconds will be achieved (see further detail in sections 0 and 0). Further, the furnace will be equipped with an automatic system which prevents waste material feed in the following situations:

- at start up until a temperature of 850°C has been reached;
- whenever the temperature of 850°C is not maintained, including shutdown;
- whenever the continuous emission monitors show that any emission limit value is exceeded due to disturbance or failure of the purification devices.

2.2.8 In the event that the automatic system is triggered, the Operator will be alerted via alarms.

Site Security

2.2.9 The site is surrounded by 1.8 metre high security fencing. Additional security will be provided by CCTV cameras and intruder alarms.

2.2.10 Vehicles accessing the site will pass via a manned gate house which will be either be occupied or be managed under automatic remote control. Where possible deliveries will take place during the following hours, which will remain unchanged from those permitted for the existing WTS:

- 07:00 and 18:00 hours Mondays to Saturdays

2.3 Energy Efficiency

General Energy Efficiency Issues

2.3.1 The Wealden Works 3Rs Facility has been designed and will be operated and maintained to minimise internal energy demand. An energy flow diagram is in Drawing 6 which indicates the energy flows for the nominal design point.

2.3.2 The Wealden Works 3Rs facility has been designed to generate energy from waste; however, the process itself will require energy to operate. The parasitic load will be supplied in the form of electricity to drive pumps, motors etc. A back-up generator, sized to ensure a safe plant start up or shut down in the event of a grid power failure, will burn low sulphur gas oil (<50 hrs per annum for testing). A breakdown of delivered and primary energy consumption at the Wealden Works 3Rs facility is provided in Table 2-1 below:

Table 2-1. Expected Breakdown of Delivered and Primary Energy Consumption

Energy Source	Energy Consumption	
	Delivered MWh	Primary MWh
Electricity from ERF	24,800	77,957
Electricity from Grid (for start-up)	130	312
Gas oil	2,300	2,300

Based on 8,000 hours operation

Consumed electricity from the ERF is based on a parasitic load of 3.1 MW over 8,000 hours of operation and is assumed to be provided by the ERF. A site-specific conversion factor of 3.14 is used to convert delivered to primary energy, this factor is based on the total thermal input of 76.7 MW and total gross electrical output of 24.4 MW; 24.4 / 76.7 = 0.318 (31.8%) efficiency; 1 / 0.318 = 3.14 site specific factor.

Note that the nominal design point for the ERF is 11.5 MJ/kg however the range of CVs that will be accommodated is between 7 – 15 MJ/kg. Similarly, the design throughput of the ERF is 24 tonnes per hour (tph) although the facility will accommodate waste throughputs between 17.3 tph and 34.5 tph.

The conversion from delivered to primary energy for electricity from the Grid (for start-up) uses a standard Grid conversion factor of 2.4.

Assumes annual fuel oil consumption of 200 tpa and net CV of 40.7 GJ/tonne.

Note that the energy consumption is based on the assumption that the ERF burns the full 230,000 tpa capacity. This is a conservative assumption as the ERF will have a much higher energy consumption than the WTS or MSMR activities.

2.3.3 The ERF will generate 21.3 MW of electricity for export after the parasitic demand of 3.1 MW.

2.3.4 Specific energy efficiency measures which will be incorporated include the following:

- the ERF is designed to produce both electrical power and heat;
- the boiler will be equipped with an economiser and superheaters to optimise thermal cycle efficiency without prejudicing boiler tube life;
- air pre-heat is minimised from extracting secondary air from the highest (which is also the warmest) point in the building, making use of natural warming of the air;
- low grade heat will be extracted from the turbine and used to preheat combustion air in order to improve the efficiency of the thermal cycle;
- unnecessary releases of steam and hot water will be avoided, to avoid the loss of boiler water treatment chemicals and the heat contained within the steam and water;
- the furnace section will be effectively insulated and lined to ensure heat is retained;
- boiler heat exchange surfaces will be cleaned on a regular basis to ensure efficient heat recovery.
- design and construction of the ERF to avoid uncontrolled air ingress;
- optimisation of the ERF layout to avoid excessive transfer of materials, where possible;
- effective plant maintenance regime to ensure energy efficiency is maintained over time and reduce down time or prolonged outages.

Operating, maintenance and housekeeping measures

2.3.5 Where relevant, operating procedures will include details of techniques to ensure that the Wealden Works 3Rs facility is operated efficiently. Maintenance and housekeeping measures will be developed as part of the preventative maintenance system. This will include details of the measures specifically aimed at maintaining the efficiency of the facility during its operational life. In particular procedures will cover the following items:

- plant condition monitoring - operation of motors and drives – daily/shift checks on operations and conditions;
- compressed air systems – regular walk round checks for leaks, procedures for use of pneumatic tools;
- steam systems – walk round checks for leaks and insulation inspection;
- lubrication systems – schedule for routine lubrication; and
- Operators will be trained in efficiency awareness.

Physical Techniques

2.3.6 The plant will be fully insulated to avoid heat losses from relevant plant items such as the main furnace, steam systems etc.

Building Services

2.3.7 Energy requirements for building services will be kept to a minimum. Energy efficient lighting will be employed where feasible and lights will be turned off in unoccupied buildings where they are not required for safety or security reasons.

2.3.8 Space heating will be limited to populated areas such as the control room and administration areas. Heating of other process buildings will not be required.

Energy Management Techniques

2.3.9 During the operational life of the Wealden Works 3Rs facility, energy use will be monitored and recorded. Periodically usage will be reviewed to identify areas for improvement and ensure that any abnormal increase in energy use is investigated and appropriate action taken to resolve the issue.

2.3.10 Any areas where improvements are identified will be incorporated within the energy efficiency plan for the site. This plan will be incorporated within the EMS to ensure that it is regularly reviewed and maintained up to date in the light of technology developments.

Consideration of Energy Efficiency with other Environmental Effects

2.3.11 Whilst maximising energy efficiency is important it is noted that other environmental issues need to be considered alongside maximising energy efficiency. Sector guidance notes the following BAT considerations and requires justification of how the proposals represent BAT:

- The choice of fuel impacts upon emissions other than carbon e.g. sulphur in fuel
- Where the potential minimisation of waste emissions by recovery of energy from waste conflicts with energy efficiency requirements
- Where the nature of the waste is such that the primary concern of safe waste disposal may be jeopardised by additional energy recovery

2.3.12 The selected fuel for the ERF comprises treated non-hazardous wastes and will replace energy currently generated from natural gas. Whilst the primary function of the ERF is waste treatment, it has the advantage of providing future power security through fuel diversification by moving away from burning fossil fuels consideration of other fossil fuels other than comparison with natural gas (as the current fuel) is not appropriate. The choice of fuel and effect upon emissions is discussed separately within section 2.4.

2.3.13 The ERF will be CHP-ready from the outset. A CHP ready (CHP-R) assessment has been undertaken and is provided in Appendix I.

Energy Efficiency – Sub-Sector specific Issues for Municipal Waste Incineration

2.3.14 As it is burning residual MSW, among other waste types, the requirements for MSW facilities are appropriate to the ERF proposals. The key requirements relevant to the ERF are:

- Steam should be generated either for direct use or for electricity generation
- Waste heat should be recovered unless to do so can be demonstrated not to represent BAT. All opportunities for CHP and district heating should be explored (see CHP-R assessment in Appendix I)
- The siting of plant near to potential or actual energy users will aid maximisation of recovery potential. Consideration of joint venture projects wherever possible

2.3.15 The electrical efficiency of 31.8% for the ERF is within the stated range for BAT associated energy efficiency levels (BAT-AEELs) for new plant of 25 – 35 % gross electrical efficiency in the updated waste incineration BREF. The proposals therefore are considered to be BAT for energy efficiency for facilities burning waste achieving a high overall energy efficiency as detailed in the previous section.

2.4 Efficient Use of Raw Materials and Water

2.4.1 Other than incoming waste, the WTS and MTP activities will not consume significant amounts of raw materials. The principal raw materials used by the Wealden Works ERF will include the following:

- Incoming waste materials
- Urea/ammonium hydroxide
- Hydrated lime
- Activated carbon
- Low sulphur fuel oil / gas oil
- Water

2.4.2 In addition, smaller volumes of water treatment chemicals and maintenance oils and greases will also be required. Expected usage and storage volumes for the main raw materials are summarised in Table 2-2 below.

2.4.3 The selection of raw materials is justified below.

Incoming Waste

2.4.4 The list of accepted waste types is provided in Appendix M. The European Waste codes applicable to the wastes to be accepted at the Wealden Works 3Rs facility are provided in Appendix M. This appendix identifies which EWC codes will be accepted to which activities at the Wealden Works 3Rs facility. The ERF is capable of processing up to 34.5 tph with a waste NCV of 7.0 MJ/kg and 38 tph in overload condition. Regardless of this, the ERF, WTS and MSMR activities will be limited to a combined throughput of 230,000 tpa.

2.4.5 Given the primary driver for the ERF the treatment of residual waste, consideration of fossil fuel alternatives is not within the scope of this project. It is not proposed to combust hazardous waste material – these would be separated out during the sorting activity and in any event these materials would present increased environmental risks as fuel compared to the proposed waste inputs.

2.4.6 The ERF has been designed to combust raw waste and RDF, and the design envelope (see combustion diagram in Drawing 4) will handle a wide variation in operating conditions. In summary the nominal design point for the ERF is 11.5 MJ/kg however the range of CVs that will be accommodated is between 7 – 15 MJ/kg. Similarly, the design throughput of the ERF is 24 tonnes per hour (tph) although the facility will accommodate waste throughputs between 17.3 tph and 34.5 tph.

Urea/Ammonium hydroxide

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

2.4.8 Usage of the reagent will be monitored and controlled to minimise ammonia slippage whilst also effectively controlling NOx emissions. Dosing will be linked to flue gas NOx levels and will be alarmed to alert the operator in the event of a problem with the dosing of the reagent.

Hydrated Lime

2.4.9 There are a number of common alternative reagents which can be used for acid gas control within the ERF; however, not all are suited for use within a dry system. Justification for the selection of the acid gas system is provided within Section **Error! Reference source not found.** and is therefore not discussed further here. Those reagents which can be used within the types of system proposed are sodium bicarbonate, lime or hydrated lime.

2.4.10 Hydrated lime and lime are reported as achieving good removal efficiencies. These reagents also support reaction temperatures which are compatible with use in a flue gas cleaning system which combines bag filters, whilst efficient temperature ranges for sodium bicarbonate systems are towards the upper limit for use with bag filters. (Note bag filters are considered BAT for particulate control). The hydrated lime is suitable for direct injection for dry systems and for use within the semi-dry stage, following on-site slaking whilst lime is suitable for injection in the dry sorption reactor.

2.4.11 Sodium bicarbonate has easier handling properties compared to hydrated lime which is corrosive. Sodium bicarbonate has a stoichiometric ratio of 1.3 compared to 1.8 for hydrated lime, but they produce similar amounts of residue due to the difference in molecular weight. There will also be a small environmental benefit in using sodium bicarbonate, in that there is potential for recycling of the residue. However, there are a number of significant disadvantages:

- The residue has a higher leaching ability than lime-based residue, which will limit the disposal options;
- The reaction temperature doesn't match as well with the optimum adsorption temperature for carbon, which is dosed at the same time;
- The sodium bicarbonate system has a slightly higher global warming potential due to the reaction chemistry; and
- The overall cost per kmol of reagent required to abate HCl is almost 75% higher.

2.4.12 Therefore, Britaniacrest have selected hydrated lime for use in the dry acid gas abatement system. Effective management and maintenance of systems handling the material will minimise the increased inherent hazards of the material itself.

2.4.13 Dosage rates of hydrated lime will be controlled and monitored to ensure usage is optimised and to avoid overdosage resulting in increased quantities of unreacted material within the APC residues. Dosage will be controlled against raw gas concentrations of SO_2 and HCl. Flow of reagent will be monitored and alarmed to indicate a failure.

Powdered Activated Carbon

2.4.14 Powdered activated carbon (PAC) is the most commonly used reagent for dioxin, furan and mercury control at waste incinerators. The main alternative to the injection of PAC would be a catalytic system, however, whilst these systems destroy dioxins and furans they do not provide control of mercury and therefore activated carbon injection would still be required.

2.4.15 PAC is therefore considered BAT for this purpose.

2.4.16 The dosage rate of powdered activated carbon within the ERF will be set based on operational experience. The performance of the PAC dosage will be confirmed via monitoring of dioxins, furans and mercury during commissioning. In addition, mercury emissions will be continuously monitored and if necessary adjusted. Dosage of activated carbon will also be alarmed to indicate a failure.

Fuel oil / Gas oil

2.4.17 Low sulphur fuel oil / gas oil will be used for auxiliary firing. The fuel oil will contain less than 0.1% sulphur. Alternatives to the low sulphur fuel oil would be liquefied gas (LPG) or natural gas.

2.4.18 LPG is a flammable mixture of hydrocarbon gases. As LPG turns gaseous under ambient temperature and pressure, it is required to be stored in purpose-built pressure vessels. If there was a fire within the site, there would be a significant explosion risk from the combustion of flammable gases stored under pressure. Considering the proximity of the facility to some residential receptors, the brickworks and the MBT plant, LPG is considered too high a risk.

2.4.19 Natural gas can be used for auxiliary firing and is safer to handle than LPG. Although occasional, when firing occurs, it requires a large volume of gas supplied from a high-pressure gas main. Whilst gas is supplied to the nearby brickworks, the main pipework and regulators would inevitably have to be upgraded, which would disrupt the brickworks. Hence, at this stage, natural gas is not considered to be a suitable fuel.

2.4.20 A low sulphur fuel oil tank can be easily installed at the facility. Whilst it is acknowledged that fuel oil is a fossil fuel and is classed as flammable, its use is intermittent and its storage does not pose the same risk profile as LPG. The combustion of fuel oil will lead to emissions of sulphur dioxide, but these emissions will be minimised as far as reasonably practicable through the use of low sulphur fuel oil.

2.4.21 Natural gas does present environmental advantages in lower emissions. However, fuel oil was selected for auxiliary firing as the onsite storage provides guaranteed availability. Taking the above into consideration, low sulphur fuel oil (gasoil) is considered to represent BAT for auxiliary firing at the Facility.

Water

2.4.22 The ERF has been designed to minimise use of fresh water. Water use is indicated in the water balance in Drawing 7. The key use of fresh water is within the boiler water treatment plant supplying top-up water to the boilers and supply to the process water tank.

2.4.23 The water system will be designed with the key objective of minimal consumption of potable water. The process water will be supplied by potable mains water. Freshwater input to the process water tank will be minimised through the collection of process waste waters for re-use. The feedwater used to generate steam in the boiler/turbine water/steam cycle will be recycled condensate. The water system will be designed for minimal process water discharge.

2.4.24 Potentially contaminated surface rainwater from the hard standings will be contained by kerbs and fed via interceptors into the attenuation pond.

2.4.25 Other water consuming processes will be:

- The wet ash conveyor and the wet ash itself; and
- SNCR injection nozzles.

2.4.26 Lost condensate will be replaced with demineralised treated water. The Wealden Works 3Rs Facility will have a water treatment plant and it is anticipated that the facility will consume approximately 3.1 m^3/hr of mains water. The water treatment plant is designed to continuously supply demineralised water.

2.4.27 Process effluents will be collected in a wastewater pit for re-use within the ERF. Excess process effluents will be transferred offsite via road tankers. Under normal operating conditions, wastewater will be generated from the following processes:

- regeneration of the resins in the demineralised water treatment plant;
- process effluent collected in site drainage system (e.g. boiler blowdown);
- effluent generated through washing and maintenance procedures; and
- water run-off collected from the bottom ash quench.

2.4.28 The wastewater pit will provide acid dosing for pH adjustment and settlement of process effluents so that it can be re-used within the ash quench. The wastewater pit will be emptied and the contents tankered off site periodically throughout the year.

2.4.29 Washdown water consumption will be minimised by the use of trigger controls on wash hoses.

2.4.30 The cooling water, foul sewer, and storm water systems (surface drainage) will be independent of each other.

2.4.31 In the event of a fire, firewater would be supplied from the mains water system. Wastewaters generated from firefighting will be retained within the ERF bunker and the site drainage system, which will be closed in a fire event through the use of penstock valves. Further detail of fire water containment is set out in the Fire Prevention Plan in Appendix H. Procedures will be in place for sampling and testing of the water and appropriate disposal arrangements will be in place. The procedure for handling, testing and disposal of fire waters will form part of the operational AMP.

Table 2-2. Main Raw Materials Usage

Raw Material	Nature	Expected Usage (approx.)	Storage including capacity	Fate	Environmental Effects	Alternatives
Incoming Waste	Non-hazardous treated waste	230,000 tpa	12,500m^3 max. (equates to approximately 2,900 tonnes)	Sorted or bulked for onward transfer or combusted in the ERF. Approximately 70% to air as flue gases; 25% solid residues for reuse/recycling, 5% disposed to landfill	The fuel has the potential to contain List I and List II substances which are potentially toxic, although this is through leachate rather than the solid waste.	Other waste likely to have similar or increased environmental effects (e.g. hazardous waste).
Ammonium hydroxide or urea	25% ammonium hydroxide solution	1,280 tpa	30 m^3 storage tank.	Reacted and reduced to nitrogen and water and released to air.	Not potentially bioaccumulative. Environmental toxicity in water: 24 hour LC50 rainbow trout 0.008 mg/l, 96 hour LC50 fathead minnow 8.2 mg/l, 48 hour LC50 bluegill 0.024-0.093 mg/l, 48 hour EC50 water flea Daphnia 0.66 mg/l at 22 °C.	Urea has lower hazards in storage and handling but higher GWP
Hydrated lime	$Ca(OH)_2$	3,600 tpa	200 m^3	Reacted with acid gases to form salts and collected with APC residues.	Low toxicity to mammals, severe irritant, corrosive.	Alternatives have similar effects
Powdered Activated Carbon	Carbon powdered	90 tpa	45 m^3 storage tank with level control to prevent overfilling	Collected with APC residues.	Low toxicity to mammals, low bioaccumulation potential, highly insoluble and immobile.	Alternatives have similar effects
Fuel Oil / Gas oil	<0.1% sulphur light fuel oil	200 tpa	95 m^3	Combusted and released as combustion gases.	Not readily biodegradable. Persists under anaerobic conditions. Has the potential to bioaccumulate. Harmful, 10 < LC/EC50 < 100 mg/l, to aquatic organisms (estimated). (LC/EC50 expressed as the nominal amount of product required to prepare aqueous test extract). Low acute toxicity to mammals. May cause physical fouling of aquatic organisms.	Natural gas (see discussion in paragraph 2.4.19 above)
Water	Town mains Water	approximately 24,800 m^3 over 8,000 hours	Raw water storage tank	Re-used or evaporated	-	Recycled water – see discussion above

2.4.32 In addition to the main raw materials, smaller quantities of boiler water treatment chemicals and maintenance oils and greases will be used within the facility.

2.4.33 All liquid reagent storage tanks (i.e. for fuel oil and maintenance oils) will be bunded to 110% of the capacity of the storage tank. Bunds will be constructed to appropriate standards and lined with materials that are impervious to the content of the material which they hold.

2.5 Avoidance, Recovery and Disposal of Wastes

2.5.1 The ERF will generate three main process wastes/residues, namely bottom ash, boiler ash and air pollution control (APC) residues. The mechanical treatment will also generate some residues intended for recovery. Expected amounts of each of these wastes is summarised in Table 2-3 below:

Table 2-3. Waste Generation, Storage and Disposal/Recovery

Waste	Expected Amount	Storage	Disposal/Recovery Route
Bottom Ash (including boiler ash)	48,400 tpa	690 m^3 ash room (flat floor)	Bottom ash will be sent to an offsite facility where metals will be extracted, and bottom ash will be sent off for re-use within aggregates.
Air Pollution Control Residues	8,160 tpa	400 m^3 APC storage silo	Disposal to landfill, following treatment, or recovery if feasible.
Oversized material (including PVC)	600	36.8 m^3 container	Transfer off-site to a suitable disposal/recovery facility
Metals	8,000	70 m^3 external covered bay	Sold to a third party for recovery/recycling.
Inert materials	10,000	70 m^3 external covered bay	Transfer off site to a suitable disposal/recovery facility.
Wood	2,000	70 m^3 external covered bay	Sold to a third party for recovery/recycling.
Sludge from process water pit	Variable	Process water pit	Tankered off site for disposal.

2.5.2 At the time of this application only the APC residues are expected to be sent to landfill, should a feasible recovery option (e.g. carbonation and subsequent recycling) not be available. This will be regularly reviewed and should an alternative re-use option be identified as feasible then preferentially this option will be used.

2.5.3 In addition to the above main wastes, smaller quantities of waste oils and used drums and containers will be generated. Where possible empty drums and containers will be returned to the manufacturers. Waste oils will be sent for recovery.

Recovered Materials

2.5.4 Wood, inerts, PVC and metals that are separated out during the sorting process will be sent off site for recycling/recovery. The oversized materials, if it cannot be reduced by shredding will also be transferred off site to a suitable disposal/recovery facility.

Incinerator Bottom Ash

2.5.5 Incinerator bottom ash (IBA) is the cooled burnt-out residue from the combustion process. Around 20-25% of the fuel burnt is expected to be converted to bottom ash. This equates to approximately 48,4000 tonnes per annum of IBA (including boiler ash).

2.5.6 IBA is generated from the furnace grate. The IBA is collected at the end of the grate in the water filled bottom ash extractor located beneath the grate, where this material is quenched. From here the ash is moved via an inclined steel plate conveyor, which permits water to drain from the ash back into the quench bath for reuse. The IBA will be processed via a specialist IBA processor off site, where it will be treated for re-use or disposal if re-use routes aren't available.

Boiler Ash

2.5.7 Boiler Ash is generated from deposits of particulates from the flue gases as they pass through the boilers and are removed through online cleaning. This comprises lighter ash particulates carried over from the furnace. The boiler ash is separately collected but will be combined with the bottom ash for disposal. The separate collection of the boiler ash allows for future flexibility and will permit separate handling should it result in the mixture being classed as hazardous. The boiler and bottom ash mixture will be subject to testing during commissioning and early operation to confirm the residue is non-hazardous. In the interim it will be disposed at landfill.

Air Pollution Control (APC) Residues

2.5.8 The remainder of the ash particles (fly ash) carried over from the furnace pass through the flue gas treatment plant to the bag filter. The bag filter unit is included to remove particulates from the flue gases prior to discharge from the stack and generates a further residue - Air Pollution Control (APC) residues comprising the fly ash and unreacted flue gas treatment residues. The total quantity of APC residue from the ERF is expected to be 8,160 tpa (based on 8,000 hours of operation per year) which represents approximately 3-4% of the incoming waste fuel.

2.5.9 APC residues are handled within a fully enclosed system. The residues will be stored in silos and discharged via sealed connections into fully contained disposal vehicles. These measures will avoid the release of dust from handling and transfer of this material.

2.5.10 There is currently no mechanism by which APC residues can be eliminated completely, however, the monitoring and control of reagent injection rates will be designed to minimise quantity of the residue formed.

2.5.11 Subject to testing to quantify the nature of the APC residues once operational, opportunities for reuse will be explored. A probable opportunity would be off site carbonation and subsequent recycling of the APC residues. At this stage, Britaniacrest will seek to permit the flexibility to landfill this material initially and until such a time as a feasible alternative solution is secured.

3 OPERATIONS

3.1 Incoming Waste and Raw Material Management

3.1.1 The main deliveries to the Wealden Works 3Rs facility will comprise incoming treated non-hazardous and hazardous waste materials.

3.1.2 The wastes will be delivered to the Wealden Works 3Rs facility within an enclosed vehicle. All vehicles will be inspected on arrival to the site to ensure they are providing adequate containment of the waste fuel. In the event that a problem arises this would be investigated and appropriate action taken to prevent a reoccurrence.

3.1.3 Loads will be weighed upon entry to the site at the weighbridge located at the site entrance. Here waste transfer paperwork will be checked to ensure that loads conform to those which the Wealden Works 3Rs facility is permitted to accept and to identify whether the load should be directed to the ERF bunker or the MSMR area within the waste processing hall (see paragraphs 3.1.12 and 3.1.13). In the event that a delivery is suspected to contain non-conforming wastes a visual spot check of the wastes will be made within the waste processing hall. If confirmed as unacceptable the load will be rejected and returned to its place of origin. If it is deemed acceptable, the vehicle will be accepted on site and directed for unloading.

3.1.4 The Wealden Works 3Rs facility will receive waste materials by conventional enclosed road vehicles via the weighbridge. The vehicles will be re-weighed on exit to establish the weight of material delivered. These vehicles will be enclosed to prevent loss of incoming waste material during transportation to the site. Checks will be made on the waste transfer note accompanying each delivery and by visual sighting on unloading to ensure that only waste for which the plant has been designed will be accepted.

3.1.5 It will not be practical to visually inspect this waste before it is tipped into the bunker or the Waste Processing Hall floor. Therefore, the incoming waste will be observed during reception as it is tipped and by the crane driver and/or a control room operator as it is mixed. Unacceptable waste will be removed from the bunker or floor for further inspection and quarantine, prior to transfer off-site to a suitable disposal/recovery facility.

3.1.6 Unsuitable wastes for the ERF could include items which are considered to be non-combustible, large/bulky items or items of hazardous waste as defined in the Waste Specification. They may, however, be accepted for materials recovery after being segregated or accepted for the ERF following size reduction. Any wastes that do not comply with the Environmental Permit will be deemed 'unsuitable" and will be placed in quarantine. After inspection in quarantine, all 'unsuitable' wastes will be loaded into a bulker or other appropriate vehicle and removed from site to a suitable alternative licensed waste management facility.

3.1.7 The crane maintenance platform will be used as a back-loading facility to remove any oversized items or non-combustible items identified within the bunker, and any unsuitable wastes rejected and out-loaded from the bunker or the Waste Processing Hall. It will then be isolated until removed.

3.1.8 A procedure will be in place as part of the EMS documenting the waste acceptance and rejection requirements. Certain wastes will require specific action for safe storage and handling. The EMS will also contain procedures for controlling the blending of waste types to avoid mixing of incompatible wastes.

3.1.9 Existing documentation will be updated and supplemented to incorporate any changes to the scheme associated with this variation application such as additional waste codes and new contracts. Documented procedures for pre-acceptance and acceptance of all wastes will be updated prior to the commencement of operation in accordance with the documented management systems for the Wealden Works 3Rs facility. It is proposed that a set of the updated documented procedures are made available to the Environment Agency prior to first acceptance of waste.

3.1.10 The updated pre-acceptance and acceptance procedures will be developed to comply with the Indicative BAT requirements in the Sector Guidance Note, including:

- A high standard of housekeeping to be maintained in all areas of the facility and suitable equipment to be available and maintained for clean-up and control of spills.
- Vehicles to be loaded and unloaded in designated areas provided with impermeable hard standing. These areas will have appropriate falls to the captive drainage system.
- Fire-fighting measures to be designed by consultation with the Local Fire Officers and insurers, with particular attention paid to the waste reception and storage areas.
- Delivery and reception of waste to be controlled by a management system that will identify the risks associated with the reception of waste and comply with legislative requirements.
- Incoming waste to be delivered in enclosed vehicles and unloaded in the enclosed waste reception area.
- Design of equipment, buildings and handling procedures to ensure there is minimal air-borne litter.
- Inspection procedures to be deployed to ensure that any wastes which would prevent the thermal treatment process from operating in compliance with its permit are removed prior to combustion.
- Supplementary inspections to take place by plant operatives during waste unloading.

3.1.11 The pre-acceptance checks on wastes being delivered to the Wealden Works 3Rs facility will include audits of the waste management companies concerned and as applicable to review their operations and confirm that the waste which they are transferring to the Wealden Works 3Rs facility is in accordance with the waste descriptions, the waste specifications and the relevant EWC codes.

Waste Reception and Storage

3.1.12 If the delivery vehicle is one of the following, it will be tipped directly into the ERF bunker:

- a front or rear-end loader carrying residual waste from commercial or municipal collections;
- a bulker carrying mixed residual burnable waste from a transfer station where the waste has been previously sorted; or
- a roll-on-off carrying either municipal or commercial residual waste with no bulky items or inert waste

3.1.13 If the vehicle is one of the following, it will proceed to the MSMR area and tip on the floor:

- a skip lorry;
- a tipper;
- a roll-on-off carrying mixed bulk waste

3.1.14 All tipping operations will take place within the waste processing hall. The waste processing hall door will be fitted with self-closing doors. Access to and from the processing hall will be via entrances fitted with fast acting doors which will remain closed unless containerised vehicles are entering or exiting the hall. The floor area within the hall will be regularly cleaned to ensure a high standard of housekeeping in this area is maintained.

3.1.15 Waste to be processed in the mechanical treatment will be delivered and stored in the pre-treatment area of the Waste Processing Hall. Residual waste will be stored in the subterranean ERF bunker. In the unlikely event that a non-conforming material is deposited in the ERF bunker the waste will be loaded out from the bunker using the crane maintenance platform as a back-loading facility and again returned to the place of origin.

3.1.16 The waste bunker itself is contained within the main waste processing hall. The bunker arrangement takes the form of a rectangular pit set down into the floor of the waste processing hall. The capacity is sufficient for approximately 2,900 tonnes or 12,500 m^3 of waste material. This equates to approximately 5 days' storage. The waste bunker will be equipped with two cranes which are designed to allow 100% redundancy i.e. one crane to be in operation and the other to be on standby. Waste fuel in the bunker will be regularly mixed by the crane to promote a homogenous feed to the ERF. The waste is then transferred by crane to the charging hoppers which in turn feed the furnace located within the boiler house. Waste fuel in the bunker will be regularly mixed to promote a homogenous feed to the ERF. Waste fuel is transferred from the bunker to charging hopper by the use of a hydraulic grab operated via an overhead crane. Here the waste is mixed to provide for a regular quality and is fed to the charging hoppers which in turn feed the grate stoker furnace located within the boiler house.

3.1.17 The fuel bunker is ventilated under negative pressure by the primary air fan. During normal operation the extracted air is fed into the combustion system. During downtime odour control measures will be implemented as described in the Odour Management Plan.

Waste Bunker Management

3.1.18 An overhead crane will be provided for transferring fuel from and carrying out mixing of waste within the bunker. The crane will operate in either manual or semi-manual operating mode. Mixing and transfer activities will be manually controlled; waste feed operations will be semi-automatic.

3.1.19 The crane operator island will be strategically located overlooking the bunker area and the tipping area, with CCTV feedback from both the bunker and the charging hopper. The crane operator will visually inspect the material within the bunker and will use the overhead crane to remove any unacceptable material to the end of the bunker. Unacceptable material will be removed from the bunker and returned to the producer.

3.1.20 A closed-circuit camera will be set over the charging hoppers to view the hopper conditions and the grab when it is unloading.

3.1.21 A bunker management scheme will be operated to ensure that waste is systematically removed and that prolonged storage of materials does not occur. This scheme will also ensure that areas of the bunker are emptied to permit visual inspection of the bunker wall integrity at least annually.

3.1.22 Odour control within the bunker area is achieved by maintaining a negative pressure with air being drawn through the furnace and combusted (see section 0) for further information. In the event of a full plant shutdown, waste volumes will be run down prior to the shutdown to minimise the amounts of material remaining in the bunker. Where possible, the shutdown will be timed to coincide with periods where the Wealden Works 3Rs facility waste deliveries can be minimised. Doors to the waste processing hall will remain closed at all times other than for access, which will be made via fast acting roller shutters with manual over-ride.

Fuels and Treatment Chemicals/Reagents

3.1.23 In addition to the waste input, the ERF will also require the following raw materials:

- Urea or ammonium hydroxide (reagent for abatement of nitrogen oxides);
- Hydrated lime (reagent for abatement of acid gases);
- Activated carbon (for the adsorption of dioxins, furans and mercury);
- Light fuel oil / gas oil (auxiliary and back-up fuel);
- Water;
- Boiler water treatment chemicals.

3.1.24 All chemical reagents will be delivered by road and discharged into dedicated storage vessels or held in purpose supplied containers. Deliveries will be overseen by a competent operative and spill containment facilities will be in place, see section 4.4 for full details.

3.1.25 Auxiliary fuel for the ERF will be light fuel oil and will be stored in a 95 m^3 bunded storage tank.

3.1.26 Other reagents will be delivered by road and discharged into dedicated bulk storage tanks. The duty member of staff will be responsible for checking that the material to be delivered is discharged into the appropriate storage vessel and for ensuring that there is sufficient capacity within the storage vessel prior to commencing unloading operations.

3.1.27 Activated carbon and hydrated lime will be used within the flue gas treatment plant. These reagents are potentially dusty. Deliveries will minimise the potential for dust releases through the use of sealed connections. Air displaced during deliveries will vent via a filter unit installed on the storage vessel. The filter unit will be visually inspected during unloading operations to ensure that it is operating effectively. In the event of a dust emission the filter will be replaced.

3.1.28 Deliveries of ammonium hydroxide will be undertaken via a sealed connection into the storage vessel. Level detection will be provided for the storage tank which will be linked via a switch to prevent overfilling. Storage vessels will be fitted with a filter to minimise fugitive emissions.

3.1.29 In the event of a spillage, any spilt material will be cleaned up immediately and disposed of appropriately.

3.2 Waste Transfer Station (WTS)

3.2.1 The WTS comprises sorting and bulking of non-hazardous household, commercial, industrial and construction and demolition waste, with asbestos storage. As part of this variation, Britaniacrest is applying to add EWC codes (19 06 04, 19 06 06, 20 03 99) and increase the overall permitted throughput from 200,000 tpa to 230,000 tpa. The WTS will also be relocated within a new building forming part of the Wealden Works 3Rs facility. Note that the WTS itself is not a building but a function carried out at the multi-purpose Wealden Works 3Rs facility. There will be no other change to the permitted WTS activities as a result of the variation.

3.3 Mechanical Sorting and Materials Recovery

3.3.1 Waste to be processed in the MSMR area of the Waste Processing Hall will be delivered and stored on the floor for temporary offloading prior to going through the simple sorting and segregation processes at the plant. Typically, materials will remain on the Waste Processing Hall floor for no more than 24 hours. The waste processing area will contain the following:

- a pile area accessible by a 360-mobile plant;
- a shredder
- a screen
- over band magnet
- eddy current separator
- mobile plant – 360, forklift truck, shovel and/or telehandlers

3.3.2 Waste will be loaded by the 360 excavator into the shredder for size reduction. In the event that any waste enters the shredder and blocks the rotor, the waste will be discharged from the shredder automatically and operations will continue with minimum interruption.

3.3.3 If the pile contains material sections (concrete, large wood sections, door & window frames etc), these will selectively be removed by the 360 excavator as required and stored in segregated containers within the processing area. Wood, PVC, inert materials (concrete & rubble) and metals will be removed to the external bays for interim storage as required to maintain waste volumes within the waste processing hall to acceptable levels.

3.3.4 Ferrous and non-ferrous components will be extracted from the waste stream by an over band magnet and eddy-current separator respectively and discharged to the containers via a belt conveyor.

3.3.5 The remaining material will then be processed through a screen to recover fines (i.e. sand, small stones, glass) that are up to 10 mm in size. These materials will be discharged through a chute and transferred to the fines container via a conveyor.

3.3.6 The remaining waste stream will then pass through an air classifier which will separate the material into the following fractions: -

- The light fraction such as paper, small wood, cardboard, textiles and plastic foils will be collected by means of a drag chain conveyor and discharged into a container;
- The heavy fraction such as glass, stone, and ceramics will be collected by means of a drag chain conveyor and conveyed to a dedicated discharge area.

3.3.7 Following the air classification, the light residual fraction will then be discharged to the waste bunker. The heavy fraction will be removed from the site for appropriate treatment and/or disposal off-site.

3.4 Energy Recovery Facility

Waste Charging

3.4.1 To ensure continuous steady state operation of the combustion stage and boiler sections, it is important to ensure that the waste materials are adequately mixed. This will be performed in the bunker by using the crane grab operating in either manual or automatic mode. The waste charging system is designed such that the plant can be sufficiently supplied by the crane operating for only a fraction of each hour. The remaining time is then dedicated to bunker management and receipt of incoming waste.

3.4.2 The crane transfers the waste materials from the bunker into a feed hopper. From the feed hopper the waste material will be deposited onto the feed grate via a water-cooled feed chute. The feed chute has been designed to hold a relatively large amount of fuel thereby creating a good air lock between the bunker and the furnace. The feed chute opening widens in a downwards direction thus avoiding blockages as the waste material travels through the chute. The connection between the hopper and the feed chute is designed to be as air-tight as possible to prevent the potential escape of fumes or excess air flows into the boiler. A hydraulic ram system pushes waste material off the feed table and onto the grate.

3.4.3 Level detection is provided in the feed chute. A low-level alarm will alert the crane operator that more waste material needs to be transferred from the bunker.

3.4.4 The feed chute is water cooled to provide temperature control. A fire sprinkler system will be installed to be triggered in the event of a fire. In addition, water cannons are installed covering the entire area of the bunker and feed hoppers. The full fire suppression measures are set out in the Fire Prevention Plan in Appendix H.

Combustion

3.4.5 The ERF will process waste through the thermal treatment process at a rate depending on the average net calorific value of the waste in accordance with the firing (hopper) diagram.

3.4.6 A single line reciprocating moving grate is where the combustion of the waste fuel takes place. The charging hopper connects into a feed chute. The fuel in the feed chute acts as a gas tight seal between the combustion chamber and the bunker. Hydraulically driven ram feeders are used to evenly distribute the incinerator charge across the width and transport it to the grate area. The grate is designed as a single line sliding grate / feed stoker and longitudinally consists of separate grate zones. The grate is longitudinally inclined. The grate bars of all zones are cooled by primary air, or if necessary, by water.

3.4.7 In accordance with the Waste Incineration BAT Conclusions (BAT-C), the furnace will be equipped with auxiliary low NOx burners fuelled by light fuel oil. The burners will be installed above the secondary air injection and will operate automatically to fulfil the following functions:

- to heat up the furnace during start-up in order to reach a temperature of at least 850ºC before waste derived material is introduced onto the grate;
- to ensure gas combustion for at least 2 seconds at 850ºC is maintained at any point where waste derived material is being burnt. An alarm will signal when there is a risk of not meeting that requirement and the burners will start automatically; and
- to ensure complete combustion of flue gases during shutdown.

3.4.8 A staged combustion air system will be employed. The injection system for the combustion air has been designed to provide effective distribution of combustion air to avoid hot zones and minimise the amount of inorganic material volatised.

3.4.9 Primary combustion air will be fed into the furnace through the underside of the grates by a primary air fan. The primary air injection is controlled to minimise NOx production and avoid excessive entrainment of particles. Secondary air will also be injected at high velocity through nozzles positioned in the walls of the combustion chamber above the level of the waste. This will create turbulence, which assists mixing of secondary air and combustion gases to achieve complete combustion of the gases. The injection points for the secondary air have been selected to ensure that the flue gas mixture and secondary air injection achieve good distribution of the oxygen. The volume of both primary and secondary air will be regulated by an automatic combustion control system. Primary and secondary air will be preheated using steam to improve plant efficiency.

3.4.10 Ash residue (IBA) is moved to the end of the grate and discharges into a water quench. The quenched bottom ash is removed from the quench bath by an inclined steel plate conveyor and discharged into the intermediate bottom ash bunker. Any water run-off from the bottom ash whilst on the belt conveyor is returned into the quench bath.

Furnace Types

3.4.11 The ERF will employ moving grate technology which is a well proven, reliable and highly effective technique for combustion of waste materials comprising or derived from MSW or commercial wastes. Demonstrable and well understood performance is a key objective in the selection of the chosen techniques for the ERF. However, it is recognised that there are a number of alternative furnace types available for combustion of waste materials. Consideration of these techniques is summarised in Section **Error! Reference source not found.**.

Furnace Requirements

3.4.12 The furnace will be designed to achieve good combustion control with the aim of minimising emissions and maximising burnout of the waste material. In particular the furnace will be designed, validated and operated to meet the requirements within the Industrial Emissions Directive 2010. For the combustion of the proposed waste materials the main IED requirements are as follows:

- a minimum temperature of 850°C for at least 2 seconds after the last injection of combustion air whenever waste material is being burnt;
- validation that temperature and residence time, and selected oxygen content are achieved, under the most unfavourable conditions;
- minimisation of the amount and harmfulness of residues;
- achievement of less than 5% loss on ignition (dry weight) in bottom ash or 3% total organic carbon (TOC); and
- to ensure that emissions to air do not give rise to significant ground level air pollution.

3.4.13 In the event that the temperature falls below the minimum temperature (850 °C) an audible alarm will be activated to alert operational staff. An automatic interlock will prevent waste feed to the furnace should the temperature fall below the minimum required. This interlock will also be activated at start-up, until the minimum temperature is achieved and whenever the continuous emission monitors show breaches of the emission limit values (over the appropriate averaging period).

3.4.14 The combustion control system to be installed at the ERF is designed to control the process to ensure operations meet IED and BAT-AEL requirements, minimise emissions that can be influenced by operating conditions on the grate (CO, NOx and VOC), achieve a constant level of steam production and maintain operation within the range of the firing diagram in Drawing 4. Central to achieving this aim is controlling the combustion process to ensure an even and sufficiently high combustion temperature profile along and across the grate. An infra-red camera system will be installed in the combustion chamber to provide continuous feedback on the temperature profile. The infra-red camera system will provide fast feedback to the control system of changes in temperature on the combustion bed zone and thus permitting a quick reaction to adjust grate movement and primary air to maintain optimal combustion. Temperature measurements will be continuously recorded from the primary combustion zone and at the exit from the secondary combustion zone.

3.4.15 The control system includes a number of interrelated control loops which adjust different operating parameters to maintain good combustion. Key variables include:

- Ram feeder speed
- Primary air flow
- Grate bar frequency (adjustable for each zone)
- Grate bar travel distance (adjustable for each zone)
- Secondary air flow

3.4.16 The furnace will typically operate with an excess oxygen level of 6 – 12%. The excess oxygen level is controlled automatically by the combustion control system to ensure that effective burn out of the waste fuel is achieved whilst avoiding adverse effects on energy efficiency by operating at too high excess.

3.4.17 In the event that levels fall below the set range the carbon monoxide (CO) control system will be manually adjusted to bring operations back within the desired range. Air control to the grate air flow with further control provided via the secondary air flow allows for a quick response to increases in CO emissions.

Validation of Combustion Conditions

3.4.18 The IED Annex VI Part 6 requires that combustion temperature and residence time (incinerators and co-incinerators) are subjected to appropriate validation at least once when the ERF is brought into service and under the most unfavourable operating conditions.

3.4.19 The combustion process of the ERF will be subject to computational fluid dynamic (CFD) modelling at the final design stage to demonstrate that the selected design will meet the IED requirements for residence time and temperature for the chosen design envelope. The output of this study will be reported and will identify:

- input data for the modelling assessment;
- any assumptions made; and
- confirm the selected model and how this is representative of the ERF.

3.4.20 A detailed commissioning plan will be drawn up in advance of the commissioning trials and will describe the methodology which will be applied to ensure that the requirements of IED Annex VI Part 6 will be met. Measurements will be performed during commissioning in accordance with

Guidance Note EPR5.01. If in demonstrating the minimum temperature of 850 °C it is not possible to locate the temperature probes at the precise point of the 2 second residence time, then a correction factor will be applied to the measured temperature.

3.4.21 The commissioning tests will assess the ERF performance over a range of operating conditions. Whilst there are some variables which can readily be tested during commissioning (e.g. waste material throughput), the treated waste material being burnt (and its NCV) will be determined by that delivered to the site and therefore will introduce some practical limitations on the extent of commissioning trials.

Combined Incineration of Different Waste Types

3.4.22 The material to be burned within the proposed ERF will comprise treated non-hazardous wastes of a similar nature and therefore the requirements under this section are not applicable.

Dump Stacks and Bypasses

3.4.23 There will be no dump stack or bypass included within the design. Under all operating conditions the flue gases will pass through the flue gas treatment plant prior to discharge from the stacks.

Cooling Systems

3.4.24 There are three main types of cooling systems commonly employed at facilities generating energy from wastes. These are:

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

3.4.25 The ERF will use the latter option. There are advantages and disadvantages in using each of these types of cooling system. However, for the proposed ERF an air-cooled system has been selected for the following reasons:

- the site is not located in close proximity to an adequate supply of water;
- air cooled systems do not require the use of chemical treatment or biocides which evaporative systems do;
- there is no visible plume from air cooled systems; and
- there is no requirement for water input.

3.4.26 Air cooled condensers have larger energy requirements compared to alternatives and can give rise to noise impacts (as can cooling towers). An acoustic package will be provided to control noise emissions. The noise assessment in Appendix C has considered noise from the air-cooled condensers and with the proposed acoustic package significant noise impacts are not predicted. See Appendix G for the site's BAT Assessment.

Boiler Design

3.4.27 The boiler and furnace are integrated to maximise energy recovery. The sides and walls of the furnace are integrated into the membrane walls of the first empty pass. The membrane walls therefore directly extract heat from the furnace. The side walls extend to the level of the grate.

3.4.28 Energy is recovered from the hot flue gases within the steam boiler. The resulting high-pressure steam is directed to the steam turbine, generating electricity which is exported to the grid.

3.4.29 The transition between the different boiler passes and the separation wall between the radiating passes are designed to promote ash separation from the flue gases and provide a uniform flow distribution through each pass and at the inlet to the convective section.

3.4.30 Whilst measures to minimise dust carryover are included within the design, some dust will still be present which over time will accumulate as fouling within the boilers. Boiler cleaning will be achieved with a cleaning system such as a rapping system in the second pass and steam soot blowers in the other passes.

3.4.31 The selected boiler will be subject to a CFD study. The CFD study will determine the exact geometric shape of the boiler sections and ensure that the selected design avoids the formation of pockets of stagnant or low velocity gas.

3.4.32 To maintain the flue gas temperature at the optimal temperature required for the flue gas treatment plant (140-145ºC), the final economiser bypass control system is implemented to control the minimum temperature at flue gas treatment inlet.

3.4.33 In order to control the solids content of the boiler feed water, a blowdown of the steam flow will be extracted. Blowdown water is flashed inside a pressurised flash tank and the flashed steam is recovered in the low-pressure steam system. The residual condensate is sent to an atmospheric flash tank prior to reuse, if possible.

Primary measures for minimisation of Dioxins within the Boilers

3.4.34 The furnace section is designed to operate at high temperature to achieve effective destruction of any dioxins within the waste fuel. However, as the gases cool within the boiler section there is the potential for reformation of dioxins whilst in the 'de-novo' synthesis range of approximately 200 – 450ºC. This section identifies the measures in place to minimise dioxin formation in the boilers and thereby reducing the reliance on downstream abatement plant to remove these pollutants.

3.4.35 The boiler convective section is designed in such a way that the retention time in the temperature range whereby dioxin reformation can take place (200-450ºC) is reduced to a minimum value due to sufficiently high velocities of the flue gases. The units provided are a standard design with maximisation of the flue gas velocity in this range.

3.4.36 The steam/metal surface temperature is kept to a minimum where the flue gas temperature is within the de novo synthesis range. Whilst the temperature is minimised, this will exceed the BAT value of 170°C although the duration that gases will spend under these conditions would average approximately 1 second.

3.4.37 The boiler passes are successively narrowed increasing the flue gas velocity from approximately 6 m/s up to 8 m/s to minimise the time flue gas temperature lies within the de-novo synthesis range.

3.4.38 Dust can promote the formation of dioxins by acting as a carrier for the catalysts for these reactions. The measures included within the ERF identified in paragraph 3.4.30 to minimise build-up of deposits and the boiler design to minimise dust carryover therefore also contribute to minimising the reformation of dioxins.

3.4.39 The above measures are considered to represent BAT for avoiding dioxin formation within the boiler section.

Energy Recovery and Distribution

3.4.40 A single steam turbine will generate electricity which will be exported to the Grid and used onsite to power the internal electrical systems.

3.4.41 The ERF will generate up to 24.4 MW and have a parasitic load of 3.1 MW. The ERF will initially operate in electricity-only mode but will be designed to operate in combined heat and power (CHP) mode in the event that a suitable heat load is identified in the future.

3.4.42 Under normal operating conditions the steam turbine will control the pressure within the boiler. Deviations in actual steam flow arising from changes in input waste material quality, for example, will be levelled out by the inlet pressure control of the turbine. The steam exhaust at the back end of the steam turbine is fed into the air-cooled condenser. The vacuum in the condensing section of the turbine is kept as low as possible in order to recover as much energy as possible.

Water Treatment Plant

3.4.43 The water treatment plant is designed to treat mains water to meet water quality specification for the boiler and turbine. Fresh water from mains supply will be treated in a demineralisation plant to meet the water quality specification requirements for the boiler and turbine. The demineralisation process will comprise a filtration unit, ion exchange unit and buffer storage for demineralised water prior to use.

3.4.44 Periodically the ion exchange unit will require regeneration using acid and alkali washes. The regeneration stage is initiated by the Operator who will be alerted via an alarm that a regeneration is required.

3.4.45 Effluent generated from ion exchange regeneration phase will contain both acidic and alkaline waters. These will be neutralised within a neutralisation tank and discharged into the process water tank prior to use within the process, mainly in the bottom ash quench.

Start-Up and Shut-Down

3.4.46 The ERF will be designed to ensure that start-up and shutdown operations, including emergency shutdown scenarios are carried out safely and without significant environmental impact.

3.4.47 The site will document the procedures for start-up and shutdown, these procedures will be in place prior to commissioning of the ERF. However, the general sequence of events is summarised below.

Cold Start-up

3.4.48 The start-up will commence with the water demineralisation unit, in order to have a supply of water ready for filling and topping-up purposes. The boiler furnace and its immediate ancillaries, the condenser and then the steam turbine generator can then be started.

3.4.49 The preheating is achieved by burning fuel oil in the burners.

3.4.50 At all stages during a cold start-up it is of prime importance to comply with the following conditions when increasing the flue gas temperature:

- controlled temperature rise gradient on the refractory lining in line with supplier recommendations in order to prevent thermal shock.
- the temperature rise is carefully controlled in order to avoid thermal stresses within the ERF.

3.4.51 Combustion of the waste derived materials cannot commence until the flue gas ducts, the dry sorption reactor and the bag filters are all at their operating temperature, and until the ash transport systems have been properly warmed by electrical trace heating.

3.4.52 The waste materials are introduced once the flue gas treatment unit is operating in hot condition and the IED temperature requirements within the boiler are also being achieved.

Controlled Shutdown

3.4.53 For a controlled shut down, this will require maintaining the auxiliary burner in order to sustain the IED 850°C, 2 seconds requirement, until all waste material on the grate has been burned out.

Emergency Shutdown

3.4.54 To extinguish combustion in an emergency, operators will use the emergency stop button resulting in immediate stopping of the combustion fan, the grate feed systems and the burner.

3.4.55 A safeguard system is installed, that automatically stops the combustion if critical parameters in the boiler or flue gas treatment operation are breached.

Flue Gas Treatment

3.4.56 Whilst the ERF is designed to minimise the formation of pollutants, abatement plant has been included for those which are generated. Combustion gases will be cleaned before they are released to the atmosphere. The flue gas treatment system will be designed to be compliant with the Industrial Emissions Directive (IED) and Waste Incineration BAT-C and will comprise the following stages:

- Selective Non Catalytic Reduction (SNCR);
- Spray absorber;
- Dry sorption reactor including both hydrated lime and activated carbon injection; and
- Fabric bag filter.

4 EMISSIONS AND MONITORING

4.1 Point Source Emissions to Air

4.1.1 There will be no point source emissions from the WTS or MSMR activities.

4.1.2 The ERF and back-up generator will give rise to emissions to air, primarily water vapour and carbon dioxide (CO_2) as a result of the combustion process. However, given the nature of the incoming waste material for the ERF there will also be low concentration releases of the following:

- nitrogen oxides (NOx);
- acid gases e.g. sulphur oxides (SOx), hydrogen chloride (HCl), hydrogen fluoride (HF);
- particulate matter;
- heavy metals; and
- volatile organic compounds (VOCs), carbon monoxide (CO), dioxins and furans.

4.1.3 The ERF will have a dedicated abatement system for controlling emissions prior to release to atmosphere. The ERF design and operation will ensure compliance with relevant emission limits as set out within the IED and Waste Incineration BAT-C. The proposed methods for control of emissions to air are detailed below whilst justification for the selected techniques is provided in Section 6.

4.1.4 Flue gases will discharge via a 95 m stack. This stack height was selected as providing optimum dispersion, details supporting the stack height determination are provided in Appendix B.

4.1.5 The back-up generator will only operate to support the parasitic load in the event of loss of access to the Grid and a trip that shuts down the plant. The generator's role will be to keep essential equipment operational, particularly when the UPS cannot support it, and allow the plant to shut down safely. It will be tested for less than 50 hours per annum and therefore routine emissions are not considered significant. Emissions will be controlled by the choice of fuel (low sulphur fuel oil) and combustion control.

Abatement of Particulate Matter

4.1.6 A fabric bag filter system will be provided for particulate control. The bag filter unit will contain compartments which will each contain a set of filter bags. The compartments can be isolated for maintenance or cleaning. Flue gases enter into the lower half of the filter. Distribution baffles inside the filter will ensure that the heaviest particulates are removed directly into the hoppers before the gases pass through the filter medium.

4.1.7 Over time there will be a build-up of particulates on the surface of the filter media, which improves the particulate removal efficiency and also provides additional reduction of acid gases with unspent reagent in the dust cake. Online cleaning will be provided using a reverse jet compressed air cleaning system to periodically remove the dust cake. The dust cake will discharge via the bottom of the filter compartment and will be collected.

4.1.8 Cleaning will be activated via pressure drop monitoring across the filter media, when the set point is exceeded the unit will commence cleaning. Cleaning operations cease when the pressure differential returns to normal.

4.1.9 The monitoring of pressure drop across the filter bags will provide a reliable system for detecting bag filter failures and allows investigation to identify and isolate the failed compartment.

Oxides of Nitrogen

Primary NOx measures

4.1.10 There are three recognised mechanisms for the formation of NOx:

- Fuel NOx;
- Thermal NOx; and
- Prompt NOx.

4.1.11 Fuel NOx relates to the conversion of fuel bound nitrogen into nitrogen oxides and therefore is partly a function of the incoming waste material. Fuel NOx is affected by the level of oxygen in the vicinity of the flame and therefore reducing oxygen levels can influence NOx emissions. However, there is a balance between minimising NOx emissions and ensuring effective combustion and compliance with IED requirements for providing good burn out of waste material and minimising carbon in ash levels to <5% LOI or <3% TOC. The proposed air supply regime has been selected to ensure that effective combustion and burnout is achieved whilst controlling oxygen levels to a minimum to limit oxidation of the fuel bound nitrogen to NOx.

4.1.12 Thermal NOx requires high temperatures and there is a direct relationship between increasing temperature and unabated NOx levels in the flue gases. The IED requires that any process burning waste material comprising or containing non-hazardous waste must maintain a minimum temperature of 850ºC.

4.1.13 Prompt NOx is formed by the relatively fast reaction (hence, the name prompt NOx) between nitrogen, oxygen, and hydrocarbon radicals.

4.1.14 In reality, this very complicated process consists of hundreds of reactions and dozens of species. Prompt NOx is an important mechanism in lower-temperature combustion processes but is generally much less important compared to thermal NOx formation at the higher temperatures found in combustion processes of the type proposed for the ERF.

4.1.15 The primary NOx controls will comprise the following:

- optimisation of the primary and secondary air feeds, providing turbulence within the combustion chamber;
- design of the ERF to ensure it is as airtight as possible;
- control of the combustion stage to ensure that optimum combustion conditions are maintained; and
- use of low NOx burners for auxiliary fuel firing.

4.1.16 Section 0 above describes how the above criteria will be met. The proposed design will ensure effective mixing and aims to provide a uniform velocity and temperature profile, therefore avoiding the potential for hotspots within the furnace which can promote thermal NOx formation. CFD modelling of the final design will be used to confirm that this will be achieved.

4.1.17 The ERF has been designed to be as airtight as practicable. The furnace is kept under negative pressure. A water seal is provided on the ash extraction preventing ingress of air into the furnace from this outlet.

4.1.18 Flue gas recirculation (FGR) has been proven to be effective in reducing NOx emissions for some furnace designs. The decision on including FGR will depend on the final design of the furnace and will be confirmed prior to start of commissioning.

Secondary NOx measures

4.1.19 In addition to the primary NOx measures identified above, the ERF will also include secondary NOx abatement. A selective non-catalytic reduction (SNCR) system will be installed using ammonium hydroxide or urea as the reduction reagent. This system will inject the reagent into the main combustion chamber via a number of nozzles located within the combustion chamber. To ensure effective NOx control the proposed design will:

- ensure port injection locations are optimised through the use of CFD modelling;
- promote good mixing of the reagent with the flue gases (see detail above on combustion air); and
- control the rate of injection of reagent to the process conditions (e.g. load and flue gas NOx and NH_3 monitoring). The NOx load is calculated as a function of either the load or the flue gas temperature. For each level of load or temperature, the maximum flow of reagent is pre-set in the control system. In addition, the NOx and NH_3 stack measurements are used as feedback signals to the reagent flow controller to adjust the dosage rate to ensure flue gas emissions are within the set values and that overdosing leading to excessive ammonia slippage does not occur.

4.1.20 If ammonium hydroxide is used, it will reduce NOx in the flue gases producing nitrogen and water vapour as per the equations below:

- $4NO + 4NH_4OH + O_2 \rightarrow 4N_2 + 10H_2O$
- $2NO_2 + 4NH_4OH + O_2 \rightarrow 3N_2 + 10H_2O$

4.1.21 In the event that urea is the reagent, due to high temperatures in the furnace, urea is decomposed into ammonia and carbon dioxide:

- $CO(NH_2)_2 + H_2O \rightarrow 2NH_3 + CO_2$

4.1.22 The produced ammonia reduces NOx in the flue gases producing nitrogen and water as per the equation below:

- $4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$
- $2NO_2 + 4NH_3 + O_2 \rightarrow 3N_2 + 6H_2O$

4.1.23 The reagent will be supplied from a storage tank. The rate of injection will be optimised during commissioning and controlled during operation to avoid overdosing of reagent thereby avoiding excessive ammonia slippage. It will also be linked to the continuous NOx monitoring, see section 4.7 for further details.

4.1.24 In selecting reagents for NOx control, there is a balance between increased environmental hazards associated with the use and storage of ammonia solution versus increased global warming effects associated with urea due to emissions of nitrous oxide (N_2O). The global warming potential (GWP) is discussed further in section 5.7.

4.1.25 Ammonia solution presents higher environmental risks associated with storage and handling of the material compared to urea, whereas urea results in a higher GWP.

Acid gases and halogens

Primary acid gas measures

4.1.26 The potential for acid creation is dictated by the content of the incoming waste material (sulphur, chlorine and fluorine content). Given the nature of the proposed waste materials, the content of these elements cannot readily be controlled and is therefore given, subject to the variability of the nature of waste materials. Mixing of the waste material in the bunker will ensure that as homogenous a composition as possible is produced and therefore assist with emissions control.

4.1.27 Whilst emission of acid gases from combustion plant can be reduced using in-furnace injection of sorbents, this technique is considered better suited to fluidised bed systems and is therefore not proposed for the ERF. Acid gas levels in the releases from the stacks will therefore be controlled using proven secondary abatement.

Secondary acid gas measures

4.1.28 Control of acid gas releases will be achieved using injection of hydrated lime. The acid gas abatement system will comprise a dry sorption reactor.

4.1.29 Dry hydrated lime is injected into the dry sorption reactor upstream of the bag filter.

Other Releases

Carbon Oxides and Volatile Organic Compounds (VOCs)

Carbon Dioxide

4.1.30 Emissions of carbon dioxide from the ERF will primarily arise as a consequence of the oxidation of carbon within the incoming waste material. For the combustion stage of the ERF the main aim is to achieve complete combustion, which thus maximises the conversion of carbon to carbon dioxide, to liberate the energy in the waste material. Therefore, for any given waste material, the carbon dioxide emissions will be limited by its carbon content. Furthermore, the achievement of good combustion (which means maximising conversion of carbon in the waste material to carbon dioxide) is BAT.

4.1.31 The EPR Sector Guidance Note (EPR 5.01)[4] notes that all measures to reduce energy use also reduce the CO_2 emissions (see Emissions Control, paragraph 50 of EPR 5.01). The selection when possible of raw materials with low organic matter content and fuels with low ratio of carbon content to calorific value reduces CO_2 emissions. For the ERF, this is only relevant to the support fuels used and the selection of light fuel oil will meet this requirement. Further, the use of support fuel will be minimised through good operational management.

4.1.32 As it is the purpose of the combustion phase to convert the waste material into primarily water and CO_2, EPR 5.01[4] indicates the areas upon which attention should focus to improve the overall impact in this area (see paragraphs 51 and 52 of EPR 5.01) . To minimise the overall impact of the ERF in terms of carbon dioxide releases, measures that minimise internal energy consumption and maximise energy recovery from combustion of the waste material will be incorporated. Details of the measures to be in place at the ERF are provided in Section 2.3, of this document.

4.1.33 Further, although not relevant to CO_2 emissions, releases of nitrous oxides associated with the use of SNCR contribute to the overall GWP associated with the ERF, however this is typically very small compared to the CO_2 from burning of the waste. The ERF meets BAT for control of the contribution to the overall GWP from nitrous oxides through controlling process conditions.

Carbon Monoxide and VOCs

4.1.34 High levels of CO and VOCs are indicative of poor combustion. As detailed earlier (see section 0), the furnace will be designed and operated to ensure that effective combustion is achieved, these measures will ensure that CO and VOC levels are controlled below required limits without the need for further abatement.

Dioxins and Furans

4.1.35 Dioxins and furans are minimised through the following:

- destruction within the combustion stage due to the high temperatures and combustion control as set out in Section 0;
- minimisation of reformation within the boiler (see section 0 above for detail); and
- abatement to remove reformed dioxins in the flue gases.

4.1.36 Powdered activated carbon (PAC) will be injected before the dry sorption reactor. PAC removes dioxins and furans through adsorption. In its powdered form, activated carbon provides a high surface area for adsorption to take place providing effective control of dioxins and furans.

4.1.37 The activated carbon will be stored in a 45 m^3 silo. The storage silo system will include level probes, mechanical discharge devices to prevent arching, rat holing and flooding, and a dust extraction unit. In addition, a load cell system will also be fitted in order to give an accurate assessment of the quantity of material within the silo.

4.1.38 Metering screw conveyors at the outlet of the silo cone will discharge PAC to rotary valves. Metering equipment will be installed at the outlet of screw conveyors, with each set being identical and able to operate independently. The dosing rate will be based on the flue gas flow and will be set during commissioning.

Metals

4.1.39 Most heavy metals will be present as particulates and will be effectively controlled within by the bag filter unit, as described above. Mercury is a notable exception, as this metal will be present as a vapour. Mercury removal is effectively controlled by adsorption onto activated carbon; see detail above for dioxins and furans.

Iodine and Bromine

4.1.40 Where wet scrubber systems are used for acid gas control, plume colouration from iodine or bromine can be a problem. The ERF will not employ a wet scrubber system.

4.2 Point Source Emissions to Surface Water and Sewer

4.2.1 Under normal operation there will be no process discharges to surface water or sewer from the Wealden Works 3Rs facility. In the event of a full boiler maintenance the ERF boilers will need to be emptied. This will be tankered and either removed from site or re-used.

4.2.2 Where possible, excess water will be used within the bottom ash quench system.

4.2.3 During heavy rain fall, clean surface water run-off will be discharged to surface water via an interceptor.

4.2.4 Waste waters from amenities will discharge to the foul sewer.

4.3 Point Source Emissions to Land

4.3.1 There will be no direct or indirect process releases to land or groundwater from the Wealden Works 3Rs facility

4.4 Fugitive Emissions

4.4.1 Fugitive releases have been identified and assessed as part of the Environmental Risk Assessment (see Appendix D). The assessment indicates that the proposed measures for control of fugitive releases will ensure that no significant risks from fugitive releases are expected from the Wealden Works 3Rs facility.

4.4.2 Good housekeeping practices will be in operation to ensure that any spillages of potentially dusty materials are cleared up at the earliest opportunity. Spill kits will be available for clean-up of all chemicals (i.e. boiler water treatment chemicals) and oils (i.e. fuel oil and maintenance oils) stored and used within the Wealden Works 3Rs facility and will be located in proximity to the relevant storage area(s) and/or delivery points. Site procedures will detail those actions which should be followed in the event of a spillage.

4.4.3 The dust management plan (DMP) in Appendix S sets out the primary sources of dust from the facility and the proposed dust control measures under normal and abnormal operation.

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

4.4.5 Table 2-3 identifies the storage tanks and containment for the main raw materials. Further storage and process tanks/drums will be provided for various waters used/recycled within the process, as follows:

- Surface water attenuation
- Process effluent pit
- Fire water tank
- Condensate tank

4.4.6 These tanks will be designed to be watertight.

4.4.7 The incoming waste material storage bunkers will be constructed of concrete and will be impervious and subject to routine visual checks when waste volumes in the bunker are low and during annual routine maintenance shutdowns.

4.4.8 All process areas will be located on hard standing.

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

4.4.10 Bunds will all be designed to contain at least 110% of the contents of the largest storage tank or 25% of the total tankage, whichever is the greater and will be resistant to the material which they are designed to contain. Any rainwater accumulated on bunds will be tested for pH and visible solids and oil. Should the tests indicate that there was no contamination; the clean rainwater would be discharged to surface water via an existing outfall as shown on Drawing 3 – Drainage Layout. In the event that the water is found to be contaminated the waters would either be treated on site or tankered for off-site disposal.

4.4.11 Underground structures will be limited to:

- the lower part of the bunker;
- the lower part of the boiler;
- site drains;
- drainage sumps; and
- incoming clean water systems.

4.4.12 The proposed drainage strategy is provided in Appendix R.

4.4.13 The ERF bunker will be subject to integrity checks during commissioning and prior to accepting waste. During commissioning the underground surface drains and foul drains will be subject to integrity testing and will be certified as sound prior to the ERF operations commencing. These drains will subsequently be tested after 6 years of operation. The condition at that time will be confirmed by CCTV inspections and will subsequently determine the inspection frequency for further inspections.

4.5 Odour

4.5.1 The odour management plan (OMP) in Appendix O sets out the primary sources of odour from the facility and the proposed odour control measures under normal and abnormal operation.

4.6 Noise and Vibration

4.6.1 Noise and vibration effects from the ERF are considered within the Environmental Risk Assessment (ERA) included in Appendix D. The ERA has followed the format of EA guidance[5,6] and concluded that no significant noise risks are expected from the ERF.

4.6.2 An assessment of the expected impact of noise from operation of the proposed facility (including commissioning) is provided in Appendix C. This Appendix identifies the main noise sources and nearest noise sensitive receptors (NSRs), characterises the noise sources, assesses its potential impact and considers those impacts in the context of relevant BAT criteria. Details of noise monitoring for the purpose of establishing the baseline levels are also provided.

4.6.3 The results of the assessment indicate that significant adverse noise or vibration effects would not be expected as a result of operating the ERF.

4.7 Monitoring and Reporting of Emissions (Water, Sewer and Air)

Monitoring and Reporting of Emissions to Air

4.7.1 There will be no emissions to air from the WTS or MSMR activities and so no monitoring is required for these.

4.7.2 The following emissions monitoring for releases to air from the ERF will be undertaken:

Table 4-1. Summary of Monitoring of Emissions to Air

Pollutant	Emission Point	Emission Limit Value (BAT-AELs)	Emission Limit Value (IED)	Monitoring Method	Monitoring Frequency	MCERTS certified?
NO_x	A1	120 mg/Nm^3 daily average	200 mg/Nm^3 daily average 400 mg/Nm^3 half-hourly average (100% A)	BS EN 15267-3	Continuous	Yes
SO_2	A1	30 mg/Nm^3 daily average	50 mg/Nm^3 daily average 200 mg/Nm^3 half-hourly average (100% A)	BS EN 15267-3	Continuous	Yes
CO	A1	50 mg/Nm^3 daily average	50 mg/Nm^3 daily average 100 mg/Nm^3 half-hourly average	BS EN 15267-3	Continuous	Yes
Particulate Matter	A1	5 mg/Nm^3 daily average	10 mg/Nm^3 daily average 30 mg/Nm^3 half-hourly average (100% A)	BS EN 15267-3 and BS EN 13284-2	Continuous	Yes
VOC (expressed as TOC)	A1	10 mg/Nm^3 daily average	10 mg/Nm^3 daily average 20 mg/Nm^3 half-hourly average (100% A)	BS EN 15267-3	Continuous	Yes
HCl	A1	6 mg/Nm^3 daily average	10 mg/Nm^3 daily average 60 mg/Nm^3 half-hourly average (100% A)	BS EN 15267-3	Continuous	Yes
HF	A1	1 mg/Nm^3 daily average or average over the sampling period	1 mg/Nm^3 daily average, 4 mg/Nm^3 half-hourly average (100% A)	BS ISO 15713	Quarterly for the first 12 months and annually thereafter	Yes
NH_3	A1	10 mg/Nm^3 daily average	n/a	BS EN 15267-3	Continuous	Yes
Hg	A1	0.02 mg/Nm^3 daily average or average over the sampling period	0.05 mg/Nm^3 average over a sampling period of a minimum of 30 minutes and a maximum of 8 hours	BS EN 15267-3 and BS EN 14884	Continuous	Yes
Heavy metals (except mercury)	A1	Cd + Tl = 0.02 mg/Nm^3 average over the sampling period Others : 0.3 mg/Nm^3 average over the sampling period	Cd + Tl = 0.05 mg/Nm^3 Others = 0.5 mg/Nm^3 Average over a sampling period of a minimum of 30 minutes and a maximum of 8 hours	BS EN 14385 (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Tl, V)	Quarterly for the first 12 months and annually thereafter	Yes
Dioxins and Furans	A1	0.04 ng I-TEQ/Nm^3 average over the sampling period	0.1 ng/Nm^3 average over a sampling period of a minimum of 6 hours and a maximum of 8 hours	BS EN 1948 Part 1-3	Quarterly for the first 12 months and annually thereafter	Yes

Pollutant	Emission Point	Emission Limit Value (BAT-AELs)	Emission Limit Value (IED)	Monitoring Method	Monitoring Frequency	MCERTS certified?
Dioxin-like PCBs	A1	0.06 ng WHO-TEQ/Nm^3 average over the sampling period (PCDD/F + dioxin-like PCBs)	n/a	BS EN 1948 Parts 1, 2 and 4	Quarterly for the first 12 months and annually thereafter	Yes
Polycyclic Aromatic Hydrocarbons (PAHs)*	A1	n/a	n/a	BS ISO 11338-1 and BS ISO 11338-2	Quarterly for the first 12 months and annually thereafter	Yes
CO_2	A1	n/a	n/a	Calculation based on waste throughput and carbon content. Method to be agreed with the EA.	Annual	No
N_2O	A1	n/a	n/a	BS EN 21258	Annual	Yes

* PAHs - Comprise; Anthanthrene, Benzo[a]anthracene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[b]naph(2,1-d)thiophene, Benzo[c]phenanthrene, Benzo[ghi]perylene, Benzo[a]pyrene, Cholanthrene, Chrysene, Cyclopenta[c,d]pyrene, Dibenzo[ah]anthracene, Dibenzo[a,i]pyrene Fluoranthene, Indo[1,2,3-cd]pyrene, Naphthalene.

4.7.3 As permitted under Annex VI Part 6, continuous measurement of HF will not be undertaken on the basis that the acid gas abatement system will operate to guarantee that the emission limit for HCl will not be exceeded. Monitoring of HF as stated in Table 4-1 above will be undertaken.

4.7.4 A valid daily average monitoring value will have no more than 5 half hourly average values in any day discarded due to malfunction or maintenance of the CEMS. No more than 10 daily average values per year shall be discarded due to malfunction or maintenance of the CEMS.

4.7.5 Monitoring results will be corrected to standard reference conditions and reported to the EA, as 273.15 K, 101.3 kPa, 11% oxygen and dry conditions.

4.7.6 An annual periodic stack test will also be undertaken by an MCERTS certified body to confirm the performance of the continuous emissions monitoring. Further, the CEMS monitoring system will be calibrated by means of parallel measurements with the reference methods at least every three years.

4.7.7 The precise location of the sampling and measurement points will be determined at the detailed design stage and details will be submitted to the EA for approval. This submission will also include an assessment of the sampling points in accordance with the M1 guidance.

4.7.8 Emission limits to air will be regarded as having been complied with where monitoring data confirms that emission values are below the limits specified in the IED for short term emissions and BAT-AELs for long term emissions (where limits apply), over the corresponding monitoring period.

4.7.9 At the daily emission limit value level, the value of the 95% confidence intervals of a single measured result shall not exceed the following percentages of the emission limit value.

- carbon monoxide 10%
- sulphur dioxide 20%
- nitrogen dioxide 20%
- total dust 30%
- total organic carbon 30%
- hydrogen chloride 40%
- hydrogen fluoride 40%

Monitoring and Reporting of Emissions to Water and Sewer

4.7.10 Under normal operation there will be no process discharges to water. Any process waters produced will be tankered off site.

4.7.11 Only surface water run-off will discharge to surface water after passing through an oil interceptor and attenuation pond.

4.7.12 Discharges to sewer will be limited to domestic effluents from the onsite amenities. There will be no process discharges to sewer.

Monitoring and Reporting of Waste Emissions

4.7.13 An ash test protocol will be developed in accordance with the Environmental Services Association (ESA) protocol, currently including:

- Total Organic Carbon or loss on ignition (for bottom ash)
- Heavy metals concentration (to include Cd, Tl, Hg, As, Cu, Co, Cr, Mn, Pb, Zn, Ni, V)
- Dioxin, furan and dioxin-like PCB content
- pH and alkali reserve

- Leachable metal ions

4.7.14 Additionally, any test that is required by the company who will be seeking to accept the processed bottom ash or the waste disposal site accepting the APC residues will be undertaken as required.

4.7.15 During operation the following routine monitoring will be undertaken:

Table 4-2. Monitoring of Waste Emissions

Residue	Parameter	Frequency
Bottom Ash (including boiler ash)	Total Organic Carbon or Loss on Ignition	Quarterly
	Heavy Metals	Quarterly
	Dioxin and Furans	Quarterly
	Dioxin-like PCBs	Quarterly
APC Residues	Total Organic Carbon or Loss on Ignition	Quarterly
	Heavy Metals	Quarterly
	Dioxin and Furans	Quarterly
	Dioxin-like PCBs	Quarterly
All wastes	Mass/Volume	Every load removed from the Wealden Works 3Rs site for disposal or recovery/recycling

Note: the use of TOC or LOI will be agreed prior to testing.

4.7.16 As stated in 4.7.13, an ash sampling protocol for the sampling of APC residues and bottom ash will be established in line with the ESA protocol and submitted for agreement with the Environment Agency, prior to commencing operations at the Site.

Monitoring During Commissioning

4.7.17 During commissioning, monitoring to at least the frequencies stated during normal operation will be carried out. All continuous monitors will be in place and operational.

4.7.18 Monitoring will also be undertaken for those parameters that are not continuously monitored. At least one set of monitoring results for start-up, shutdown and continuous running will be undertaken to establish satisfactory operation is being achieved at all times. This will form part of the ERF acceptance test. Monitoring of all releases (to air, water, waste etc.) will be carried out.

4.7.19 Following completion of satisfactory commissioning, periodic sampling will be carried out at the frequencies specified within the permit. Table 4-1 above confirms the proposed frequency of undertaking periodic monitoring for those species that are not monitored by the CEMS, this meets the requirements for monitoring as specified within the IED, Waste Incineration BAT-C and within EPR Guidance. The proposed monitoring is considered consistent with monitoring undertaken at similar installations.

Environmental Monitoring (Beyond the Installation)

4.7.20 A programme of environmental monitoring beyond the installation will be carried out in accordance with the requirements of the permit when issued.

Monitoring of Process Variables

4.7.21 The following monitoring of process variables will be undertaken:

Table 4-3. Summary of Process Monitoring

Line (s)	Process Variable	Description
L1	Combustion temperature	Continuous monitoring to demonstrate compliance with minimum temperature requirement of 850 °C as required by IED Article 50(3) and Annex VI Part 6
L1	Oxygen content in the combustion chamber	Continuous monitoring to ensure good combustion is achieved and to minimise CO and NOx formation.
L1	Flue gas temperature	Continuous monitoring as required by IED Annex VI Part 6
L1	Flue gas pressure	Continuous monitoring as required by IED Annex VI Part 6
L1	Flue gas water vapour content	Continuous monitoring as required by IED Annex VI Part 6
L1	Flue gas oxygen content	Continuous monitoring as required by IED Annex VI Part 6
L1	Flue gas flowrate	Continuous monitoring to enable evaluation of mass emissions.
L1	Reagent flowrate	Continuous monitoring to ensure optimal addition of reagents (hydrated lime, activated carbon and solid urea).
L1	Waste material delivered to the facility (tonnage)	Recording of input tonnage (via crane grab) to demonstrate compliance with design capacity.
3Rs	Waste material delivered to the 3Rs facility (tonnage)	Recording of input tonnage (via weighbridge) to demonstrate compliance with maximum throughput.
L1	Steam exported (when applicable)	Continuous monitoring to track plant efficiency.
L1	Electricity exported	Continuous monitoring to track plant efficiency.
L1	Internal energy usage	Periodic monitoring to track plant efficiency.

L1 – ERF Line 1

Note that the incoming waste will be weighed at the weighbridge on entry to the site and all waste fed to the ERF will be measured by the crane. All waste leaving the site will be weighed and the type of waste noted at the exit weighbridge. Therefore the amount of waste sent off site for recovery vs disposal will be measured, but the amounts of residual waste delivered directly to the ERF vs to the ERF via the waste processing will not be measured directly but could be calculated via a mass balance.

Monitoring Standards (Standard Reference Methods)

4.7.22 The information provided within the sections above details the proposed monitoring and identifies the relevant methods proposed for monitoring.

4.7.23 In addition, quality assurance monitoring will be undertaken in relation to the CEMS system in accordance with the requirements of BS EN 14181.

5 IMPACTS SUMMARY

5.1.1 To support this application a number of environmental impact assessments have been completed. The full details of these assessments are appended to this application and for each of the environmental issues discussed within this section a reference to the location of the full assessment is provided.

5.2 Emissions to Air

5.2.1 An air quality assessment has been undertaken to support this application and full details of the assessment are reported in Appendix B. The assessment is based on the same report and dispersion modelling undertaken to inform the Environment Statement, which accompanied the Planning Application.

5.2.2 The approach to the assessment of emissions from the ERF stack has involved the following key elements:

- Establishing the background Ambient Concentration (AC).
- Quantitative assessment of the effects from the completed development on local air quality from stack emissions utilising “new generation” Gaussain dispersion model, ADMS 5.
- The assessment has considered both the Process Contributions (PCs) from the facility in isolation, and the resultant Predicted Environmental Concentrations (PECs) that include the AC.

5.2.3 The quantitative assessment includes consideration of two operational scenarios:

- Scenario 1: Operation of the proposed ERF assuming emissions at the short-term IED emission limit values (ELVs); and
- Scenario 2: Operation of the proposed ERF assuming emissions at the long-term IED ELVs.

5.2.4 Scenario 1 represents the worst-case scenario for the short-term effects from the proposed ERF, while Scenario 2 represents the worst-case scenario for the long-term effects. Both these scenarios are deemed worst-case as they assume that the proposed ERF will operate at the limits set out in the IED. In reality, the proposed ERF is expected to operate below these limits.

5.2.5 For each of the five years of meteorological data from Charlwood, the maximum predicted ground-level concentration in the modelled domain and at each of the discrete receptors has been derived.

Determination of Appropriate Stack Height

5.2.6 The dispersion modelling for the purposes of stack height determination assumed a domain of 10 km by 10 km centred on the Wealden Works 3Rs site and with a grid spacing of 100 m. Results were reported for the location where the highest concentration is predicted. This is considered a robust and conservative approach.

5.2.7 The stack height selected for the optimum dispersion of pollutants is determined to be 95 m based on the findings of the stack height determination presented in Appendix 7.2 to Appendix B. The dispersion modelling results indicate that local building wake effects do not materially affect dispersion above a height of 95 m.

Dispersion Modelling Assessment Results

5.2.8 The results of the modelling are discussed for the two scenarios modelled below.

Scenario 1

5.2.9 The results of the assessment of short-term emissions indicated that the maximum predicted process contribution (PC) as a percentage of the Environmental Quality Standard (EQS) was for SO_2 (15 min 99.9th percentile) at 7%. All other pollutants were lower and HCl was less than 1%. All PCs were below 10% of the relevant EAL and therefore not significant.

5.2.10 The predicted environmental contributions (PECs) for all pollutants are well below the relevant EQS and therefore effects at short-term limits were not considered significant.

Scenario 2

5.2.11 All the long-term PCs are less than or equal to 1% of the relevant EQS, with the exception of SO_2, NO_2, Cd, As, Ni and PAHs which are 2%, 3%, 4%, 67%,, 10% and 16% respectively.

5.2.12 The PECs from the ERF for all pollutants are less than 100% of the EQS with one exception of PAHs. Appendix 7.5 of Appendix B shows that, at the nearest sensitive receptors, the PEC is below the EAL and the long-term PAH effect is not considered to be significant.

Assessment of Ecological Impacts

5.2.13 Contributions of air pollutant concentrations and deposition from the proposed ERF to designated ecological sites have been assessed in Appendix R to this main permit application document.

5.2.14 The results of the assessment of ecological impacts are detailed further in section 5.4 below.

Cumulative Effects

5.2.15 The potential cumulative effects of the proposed ERF with the other proposals nearby, which includes an increase in annual waste throughput, and other cumulative developments were also modelled in the air quality assessment in Appendix B and were found to be insignificant.

Abnormal Emissions

5.2.16 The air quality assessment of abnormal operations in Appendix K concluded that under abnormal operations, all air quality impacts would have an insignificant effect.

5.3 Human Health

5.3.1 A detailed human health risk assessment (HHRA) has been completed to identify potential health risks associated with exposure to emissions from the proposed facility. Full details of the assessment are provided within Appendix E.

5.3.2 The HHRA focused on contaminants of potential concern (COPCs) to the health of humans including dioxins/furans and dioxin-like polychlorinated biphenyls (PCBs). The assessment considered both primary effects from direct exposure (inhalation etc) and also potential secondary exposure, following deposition and subsequent uptake of these COPCs into the food chain.

5.3.3 In the absence of UK protocols for this type of assessment, the US EPA “Human Health Risk Assessment Protocol” (HHRAP) methodology has been used, comparing human exposure to dioxins and furans against the Committee of Toxicity (COT) Tolerable Daily Intake (TDI) of 2 pg/kg per day. The HHRAP default values have been used for a large amount of the input parameters for the model.

5.3.4 The maximum contribution of the ERF to the COT TDI is 3.3% for the farmer receptors and 0.1% for the residential receptors. It has been demonstrated in this HHRA that for the maximally exposed individual, exposure to dioxins, furans and dioxin-like PCBs is not significant.

5.3.5 It was therefore concluded that potential exposure to the emissions from the ERF, with consideration to background exposure where appropriate, will not pose unacceptable risk to the residential or farmer receptors identified in the vicinity of the facility.

5.4 Assessment of Ecological Impacts

5.4.1 The need for an Appropriate Assessment is set out in Article 6(3) of the Habitats Directive 92/43/EEC and transposed into British law by the Conservation of Habitats and Species Regulations[7]. The Habitats Directive applies the precautionary principle to relevant designated areas, in so much as plans and projects can only be permitted having ascertained that there will be no adverse effect on the integrity of a SPA or SAC, collectively termed Natura 2000 sites.

5.4.2 It is Government policy (as outlined in Planning Policy Statement 9: Biodiversity and Geological Conservation) for sites designated under the Convention on Wetlands of International Importance (Ramsar sites) to be treated as having equivalent status to Natura 2000 sites. As such, information to inform a local authority Appropriate Assessments needs to cover features of any relevant Ramsar site.

5.4.3 Whilst it is the responsibility of the competent authority to determine whether it can be concluded there is no adverse effect, it is the responsibility of applicants to submit sufficient information to enable such a determination to be made.

5.4.4 To support this application, information to inform the decision is provided as Appendix 7.6 to the AQ Assessment in Appendix B.

5.4.5 The EA habitats screening report identified 1 site of special scientific interest (SSSI), 1 local nature reserve (LNR), 2 local wildlife sites (LWSs) and 15 ancient woodlands (AWs) within 2 km of the site. No European designated nature conservation sites within 10 km of the site were identified.

5.4.6 Concentrations of NOx, SO_2 and NH_3 were predicted using the same model as used in the AQ assessment. Modelling was undertaken for a grid of receptor points across each identified nature conservation site. The receptor grid points were modelled at ground level.

5.4.7 PC and, if appropriate, PECs of NOx, SO_2 and NH_3 were calculated in comparison with the relevant critical level. The ambient concentrations and existing deposition rates were obtained from the UK Air Pollution Information System (APIS).

5.4.8 The impacts of the maximum annual means for NOx, SO_2 and NH_3 were all screened out as insignificant. The other impacts of maximum nitrogen deposition were screened out as insignificant, as was the maximum acid deposition.

5.4.9 Conservative PCs for the ERF were used in this assessment, and so the results are considered worst case.

5.5 Emissions to Water and Sewer

5.5.1 The proposed ERF will not give rise to process emissions to water and sewer. The only aqueous discharges will comprise surplus surface rainwaters which will discharge to surface waters. These waters will be clean rainwater. Any surface waters from roadways, car parking areas etc, where there is the potential for oil contamination, will pass via an interceptor and attenuation pond.

[7] The Conservation of Habitats and Species Regulations, No. 1012, November 2017.

5.6 Noise

5.6.1 Appendix C of the application provides details of the assessment of noise and vibration effects from the operation of the Wealden Works 3Rs facility.

5.6.2 Baseline noise levels were established from the worst cases from survey data collected in 2016 and September 2020. Details of the baselining are given in Appendix C.

5.6.3 The predicted operational noise levels at noise sensitive receptors were concluded to be at or below the prevailing background levels at all receptors and below the critical health effects thresholds. A small increase of 1 dB was predicted at two locations where the noise levels are already above the critical health effect thresholds. On this basis, the noise impacts from the operation of the Wealden Works 3Rs facility are considered to be low.

5.6.4 Given the separation between the site and its nearest residential receptors, vibration from operational activities will be significantly below the negligible significance criteria. As such, vibration is considered to have no significant adverse effect.

5.6.5 A noise management plan (NMP) has been produced for this facility, which sets out the measures to be put in place to minimise the effects of noise and vibration from the operation of the Wealden Works 3Rs facility. The NMP is provided in Appendix T.

5.7 Global Warming

5.7.1 Global warming effects have been considered within both the H1 Environmental Risk Assessment (ERA) (Appendix D).

5.7.2 The H1 ERA has identified the global warming potential (GWP) from the ERF alone. The H1 ERA estimated the GWP from the facility as 50,955. This figure was adapted from the Carbon assessment undertaken for planning which includes biogenic and non-biogenic carbon and nitrous oxide releases from burning of the waste fuels and auxiliary burners. The types of waste accepted at the Wealden Works 3Rs facility would typically contain approximately 50% biogenic carbon, which should be excluded from the calculation of GWP. As it includes biogenic carbon and nitrous oxide releases as well as non-biogenic carbon releases, the GWP figure is therefore conservative. Note that power to the WTS, MSMR, and ERF activities under normal operation is provided by the ERF and therefore CO_2 emissions from these processes are accounted for.

5.8 Photochemical Ozone Creation Potential (POCP)

5.8.1 Releases of carbon monoxide, sulphur dioxide and nitrogen dioxide from the proposals have the potential to give rise the creation of ozone. The total POCP for the ERF is 939.31.

5.8.2 Releases of POCP are discussed in further detail within the ERA in Appendix D, the options appraisals in Appendix G and in Section 6 of this report in support of the selection of the abatement plant for controlling the releases.

REFERENCES

1. The Environmental Permitting (England and Wales) Regulations, 2016.
2. Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0075&from=EN
3. The Incineration of Waste (EPR 5.01), March 2009, Environment Agency.
4. Commission implementing decision (EU) 2017/1442 of 31 July 2017 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for large combustion plants.
5. Risk assessments for your environmental permit, 1st February 2016, Environment Agency. Available online: https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit
6. Air emissions risk assessment for your environmental permit, 1st February 2016, Environment Agency. Available online: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit
7. Energy efficiency standards for industrial plants to get environmental permits, 1st February 2016, DEFRA and Environment Agency. Available online: https://www.gov.uk/guidance/energy-efficiency-standards-for-industrial-plants-to-get-environmental-permits
8. The Conservation of Habitats and Species Regulations, No. 1012, November 2017.
9. Best Available Techniques (BAT) Reference Document for Waste Incineration, November 2019, European Commission. Available online: https://eippcb.jrc.ec.europa.eu/sites/default/files/2020-01/JRC118637_WI_Bref_2019_published_0.pdf
10. Commission implementing decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019D2010&from=EN
11. Integrated Pollution Prevention and Control Reference Document on the Best Available Techniques for Waste Incineration, August 2006, European Commission. Available online: http://eippcb.jrc.ec.europa.eu/reference/BREF/wi_bref_0806.pdf

GLOSSARY

AC	Ambient concentration
AD	Anaerobic digestion
AMP	Accident Management Plan
AONB	Area of Outstanding Natural Beauty
APC	Air Pollution Control
APIS	Air Pollution Inventory System
ATT	Advanced thermal treatment
BA	Bottom ash
BAT	Best Available Technique
CCTV	Closed Circuit Television
CFD	Computational Flow Dynamic
CHP	Combined Heat and Power
CO	Carbon monoxide
COPC	Contaminant of potential concern
COT	Committee of Toxicity
CV	Calorific value
DEFRA	Department for Environment, Food & Rural Affairs
EA	Environment Agency
EAL	Environmental assessment level
EfW	Energy from waste
ELV	Emission limit value
EMS	Environmental management system
EPR	Environmental Permitting Regulations
EQS	Environmental quality standard
ERA	Environmental risk assessment
ESP	Electrostatic precipitator
EWC	European Waste Catalogue
FB	Fluidised bed
FGR	Flue gas recirculation
GWP	Global warming potential
HCB	hexachlorobenzene
HCl	Hydrogen chloride
HF	Hydrogen fluoride
HGV	Heavy goods vehicle
HHRAP	Human health risk assessment protocol
IED	Industrial Emissions Directive

IMS	Integrated management system
LCP	Large Combustion Plant
LOI	Loss on ignition
MSW	Municipal solid waste
MW	Megawatts
NCV	Net calorific value
NNR	National Nature Reserve
NOx	Nitrogen oxides
NSR	Noise sensitive receptor
PAC	Powdered activated carbon
PC	Process contribution
PCB	Polychlorinated biphenyl
PEC	Predicted environmental concentration
POCP	Photochemical ozone creation potential
RDF	Refuse derived fuel
SAC	Special Area of Conservation
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SOx	Sulphur oxides
SPA	Special Protection Area
SRF	Solid recovered fuel
SSSI	Site of Special Scientific Interest
TDI	Tolerable daily intake
TOC	Total organic carbon
tpa	tonnes per annum
VOC	Volatile organic carbon
WtE	Waste to Energy

Drawings

Drawing 1 Site Location

Drawing 2 Permit Boundary and Layout

Drawing 3 Drainage Layout

Drawing 4 Combustion Diagram

Drawing 5 Mass Balance

Drawing 6 Energy Balance

Drawing 7 Water Flow Diagram

Drawing 8 Organisation Chart

Drawing 9 Process Flow Diagram

Appendices

Appendix A

Application Forms

Appendix B

Air Quality Assessment

Appendix C

Noise Assessment

Appendix D

Environmental Risk Assessment

Appendix E

Human Health Risk Assessment

Appendix F

Application Site Condition and Baseline Report

Appendix G

BAT Assessment

Appendix H

Fire Prevention Plan

Appendix I

CHP Ready Assessment

Appendix J

Environmental Statement

Appendix K

Abnormal Emissions Air Quality Assessment

Appendix L

List of Directors

Appendix M

List of EWC Codes

Appendix N

R1 Calculation

Appendix O

Odour Management Plan

Appendix P

Drainage Strategy

Appendix Q

Existing Management System

Appendix R

Pest Management Plan

Appendix S

Dust Management Plan

Appendix T

Noise Management Plan