Newhurst Energy Recovery Facility

Environmental Permit (EP) Variation Application
Best Available Techniques and Operating Techniques (BATOT) Statement

May 2018
Version 2
SLR Reference: 413.00034.00562/BATOT

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1.0 INTRODUCTION

Biffa Waste Services Limited (Biffa) and Covanta Energy Limited (Covanta) signed a Memorandum of Understanding to jointly develop the Newhurst Energy Recovery Facility (Facility or ERF). Biffa will remain operators of the facility.

1.1 The Applicant

Biffa Waste Services Limited (Biffa) is a leading integrated waste management business in the UK which operates across the breadth of the waste management value chain. It provides waste collection, treatment and recycling, and disposal services to around 70,000 local and national customers in the industrial, commercial and municipal sectors.

1.2 Proposed Development

Biffa propose to develop land at Newhurst Quarry, Shepshed, Leicestershire as an Energy Recovery Facility (ERF). The facility will process up to 350,000 tonnes per annum of non-hazardous residual municipal solid waste and / or commercial and industrial waste in conformance with its existing planning permission.

At the time of submitting this EP application, Biffa and Covanta are in ongoing discussions with a number of technology providers. From the initial discussions, some technology providers have indicated that they would be able to deliver a facility with the proposed plant capacity with a single stream facility, whereas other technology providers have indicated that they would propose a two stream facility.

Taking this into consideration, Biffa and Covanta is not able to state the number of streams which are being applied for at the time of submission of this application. It is proposed that a pre-operational condition is included within the EP which requires Biffa to confirm the number of streams to be included within the design of the facility no later than two years prior to commencement of commissioning of the facility.

Through the procurement process, the abatement systems for NOx and reagents within the abatement systems may need to be amended. The development will include a Combined Heat and Power (CHP) plant and ancillary offices and will herein after be referred to as an ERF.

SLR Consulting Limited (SLR) has been retained to update the Best Available Technique (BAT) Statement and Operating Technique (OT) Document as part of an application to the Environment Agency (EA) to vary the Environmental Permit (EP) for the ERF plant. This document combines the requirements of the following Guidance notes to address the BATOT to be employed at the development:

- EPR 5.01 – The Incineration of Waste, Environment Agency, March 2009 (hereafter referred to as 'EPR 5.01');
- Develop a management system: environmental permits, February 2016; and
- Control and monitor emissions for your environmental permit, February 2016.

1.3 Environmental Permit

The site currently holds an EP (Ref: EPR/TP3036KB) which was originally issued by the Environment Agency (EA) on 8th June 2011 and was most recently varied on 13th December 2013 to reflect the implementation of the Industrial Emissions Directive (IED).

The site is currently regulated under Schedule 1 of the EP Regulations, in Section 5.1, Part A (1) b) – *the incineration of non-hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity exceeding 3 tonnes per hour.*

Although the site has held an EP since 2011, the facility has not been constructed and is therefore not operational at this time.

1.3.1 2018 Variation Application

This BATOT document has been updated to reflect the changes proposed in this variation application. The Non-Technical Summary (reference: 413.00034.00562/NTS) should be read in conjunction with this BATOT.

The changes in this variation application, have led to a number of the BATOT appendices being updated, a summary of which is detailed below;

Appendix BATOT1 – Environmental Policy: no change from the original application.

Appendix BATOT2 – Management Structure: no change from the original application.

Appendix BATOT3 – Flood Risk Assessment: the original assessment submitted with the 2011 EP application has been updated to take account of recent legislation and guidance. It must be noted that majority of the amended ERF design, as detailed in Section 2 of this NTS, is the same as was originally assessed.

Appendix BATOT4 – Global Warming Potential Assessment: no change from the original application as the principles of the assessment remain the same.

Appendix BATOT5 – Typical Water Balance: has been updated to reflect the changes included in this EP application.

Appendix BATOT6 – European Waste Catalogue for Acceptance: no change from the original application.

Appendix BATOT7 – Air Quality Dispersion Modelling Assessment: a new AQDMA has been prepared for this EP variation application. The assessment of the ERF combustion emissions concluded:

- There are no predicted exceedances of short-term or long-term EALs at the point of maximum ground level impact or at relevant exposure locations for any of the scenarios assessed;
- The predicted impact on designated sensitive habitats are considered insignificant and will cause 'no significant pollution' according to EA guidance; and
- The model sensitivity assessment shows none of the variations in the parameters investigated lead to exceedances of the EALs or any material change to the overall conclusions of the assessment.

Appendix BATOT8 – Ecology Assessment: an extended Phase 1 survey was repeated and new GCN surveys undertaken to enhance the amount of baseline data available for the planning application submitted and approved in 2015. The original Ecology Assessment and the new surveys are included as Appendix BATOT8 of this variation application.

Appendix BATOT9 – Noise Assessment: the proposed changes to the ERF scheme were re-assessed in the 2014 planning application. Overall, it was concluded that the design changes to the ERF would not lead to any significant impacts and that the ERF could still be operated within the terms of the previous planning consent. The new assessment involved the preparation of a new noise model, which included all items of plant within and external to the ERF building. The new Noise Assessment has replaced the previously submitted report for the original EP application, and is included as Appendix BATOT9 for this variation application.

Appendix BATOT10 – Questions as per EPR5.01 (1 – 36): only minor changes required due to the submission of this variation application. The responses to these questions have been updated and are included as Appendix BATOT10 of this variation application.

Appendix BATOT11 – Acid Gas Abatement Assessment: no change from the original application as the principles of the assessment remain the same.

Appendix BATOT12 – NO_x Abatement Assessment: revisions from the original application were made to be consistent with this permit variation application; however, the principles of the assessment remain the same.

Appendix BATOT13 – Human Health Review; a new Human Health Review has been prepared for this EP variation application. The review concluded that:

> The findings of the assessment are that the predicted risks and hazards as a consequence of emissions from the proposed ERF are all within limits for the protection of human health as defined by the EA or US-EPA guidance.

This conclusion is considered robust on the basis of the worst case approach adopted in the characterisation of emissions, the safety factors incorporated into the US-EPA HHRA Protocol, and the hypothetical worst case exposure scenario considered in the assessment.

Drawing BATOT1 – Longitudinal Cross Section: the original drawing submitted with the 2011 application has been updated to reflect the changes to the layout of the ERF building. The updated drawing, (reference: NH 3/5, dated June 2014) has been included in the BATOT document for this variation application.

1.4 Summary of the ERF

The proposed facility will incorporate modern, reliable and well understood combustion and pollution abatement technology. The plant will be designed in accordance with the requirements of the Industrial Emissions Directive (IED) (2010/75/EU) and will employ BAT in accordance with EPR 5.01.

The ERF facility will operate continuously on a 24-hour, seven days per week basis. In summary the development will comprise the following stages, which are outlined further in Section 1.4:

- waste reception;
- combustion;
- energy recovery;
- flue gas treatment; and
- residue handling.

The Heat Plan, produced for the original EP application, details the potential for provision of heating capacity to the local area. If implemented, this scheme would potentially substantially reduce the carbon footprint of the urban environment, both in terms of fossil fuel consumption to generate electricity, reduced emissions from landfill operations and reduced gas consumption for domestic and industrial heating. The generation of power from the plant would also improve security of supply through reducing the reliance on less secure fossil fuel sources.

The proposals fully accord with the national, regional and local and waste plans, as detailed in the planning application Environmental Statement submitted as Appendix C2_3of this EP variation application. No change has been made to the Heat Plan through this EP variation and this document has been previously agreed upon in the original EP application.

1.5 The Site Setting

Newhurst Quarry is located in Shepshed, Leicestershire and forms part of the Charnwood Quarry Complex located on the northern edge of Charnwood Forest adjacent to the M1 motorway, immediately south of Junction 23. The site location is illustrated on Drawing 001. The conceptual site layout and EP boundary is illustrated on Drawing 002. The location of the site and nearby receptors is illustrated on Drawing 003 Sources, Pathways and Receptors and Drawing 004 Cultural and Natural Heritage.

The Charnwood Quarry Complex consists of two linked quarries, both of which are currently inactive:

- Newhurst Quarry, located on the west side of the M1 Motorway; and
- Longcliffe Quarry, on the eastern side of the Motorway (accessed through Newhurst Quarry and under the motorway).

The ERF is located at National Grid Reference (NGR) SK 489 181, approximately five kilometres west of the centre of Loughborough. The site is accessed from the A512 Ashby Road East located approximately 60m north of the site, some 300 metres west of Junction 23 on the M1.

It has been established that there are no European or international statutory nature conservation designations within a 2km radius of the site. There are no ecological designations within the permit boundary. There are 2 Sites of Special Scientific Interest (SSSI) within the vicinity of the site. Further detail relating to the site setting is given in the Environmental Risk Assessment (reference 413.00034.00562/ERA) which is submitted in Section 4 of this EP variation application.

1.6 Process Summary

Overview

The proposed energy recovery facility (ERF) plant will comprise the following:

- waste reception area and waste storage;
- one (for 350,000tpa) or two incineration lines (two at 175,000tpa each);
- water, fuel and air supply systems;
- boiler;
- steam turbo-generator;
- facilities for treating exhaust gases;
- on-site facilities for residue treatment/storage and wastewater;
- exhaust stack; and
- devices / systems for control of incineration operations and recording/monitoring of plant operational conditions.

All aspects of the ERF including plant, equipment, civil/structural and building works will be designed, manufactured, constructed and installed in accordance with British statutory requirements, regulations, related technical guidance notes and codes of practice in force at the date of this document, including EPR 5.01. Equipment will be sourced within the UK where suitable.

The facility will comprise two furnace streams fed from a single waste storage bunker. Whether the facility has one or two incineration lines, the plant will be designed to combust 43.33 tonnes per hour (tph) as identified by the firing diagram included with this application (see Figure 4)[1]. This variation application is submitted for a plant assumed to be receiving rMSW with a net calorific value (CV) of 10.5MJ/kg. The total plant capacity is 43.33 tph of waste, which equates to 350,000tpa throughput. Steam produced will be used to typically generate approximately 43MW, with 38MW available for export to the National Grid.

EA Guidance EPR 5.01 – Waste Incineration for the recovery of electricity from the incineration of waste, states that "5-9 MW of electricity should be recoverable per 100,000 tonnes of annual waste throughput". The ERF will typically generate approximately 38 MW for export and as a result will generate approximately 10.8 MW per 100,000 tonnes of waste. Therefore, this is in excess of the threshold stated in EA guidance.

A conceptual site layout and the Environmental Permit boundary is illustrated on Drawing 002.

Combustion Process

Combustion of waste in the furnace will take place on a mechanical moving, inclined, grate to ensure continuous mixing of waste and promote good combustion. As waste enters the furnace it will first passes through a drying zone, then a combustion zone and finally a burnout zone. Primary combustion air will be extracted from within the tipping hall and fed in below the waste through the grate bars to promote good solid phase combustion.

Secondary combustion air will be injected above the grate to ensure good mixing and combustion control of the volatile gases. A ammonia or urea reagent will be injected into the combustion gases at the top of the first pass of the boiler to react with oxides of nitrogen, chemically reducing them to nitrogen and water. Auxiliary low sulphur gas oil burners are fitted for start-up sequencing and to maintain temperatures within the secondary combustion zone above 850^0C for two seconds. Oxygen concentration and temperature will be monitored to ensure complete combustion and minimise dioxin emissions.

Bottom ash from the grate will be transported by the grate to the bottom of the hearth and into a water-filled quench pit. A conveyor will transport ash to the discharge point in the bottom ash storage and treatment hall.

Energy Recovery

Steam generating boilers will be located immediately above the incineration grate. Hot gases from waste combustion will pass through the vertical boiler. The boiler will comprise five stages, including a series of waterwalls, convective section(s), super-heaters and an economiser. The economiser preheats feed-water supplied to the boiler and ensures the flue gas temperature is optimum for the flue gas treatment system. Using computational fluid dynamics (CFD) the boiler will be designed to reduce rapidly the temperature of the flue gases through the critical temperature range, to minimise risk of dioxin reformation.

The steam produced in the boiler will be supplied to the steam turbine turbo-generator set. The turbo set will generate electrical energy for the plant and supply to the external electrical grid. By means of turbine steam extractions, low-pressure steam will be taken for internal uses in the plant. After the turbine the expanded steam will be condensed in an air-cooled condenser with condensate returned to the feed water tank.

Turbine System

The energy recovery system will include the following turbine specification:

- extraction / condensation turbine;

- complete hydraulic and lubricating oil system;
- generator with voltage regulator;
- electrical equipment of the generator, including protection and controlling the operation and monitoring at the local control panel of the turbine; and
- local control panel for local operation.

Steam pressure will be controlled by the steam turbine's inlet pressure control valve. Steam flow is controlled by the boiler controls. Exhaust steam from the turbine is condensed in the air-cooled condenser. The turbine extractions will supply low pressure (LP) steam for auxiliary systems such as de-aerator/feed water tank, primary and secondary air pre-heater, feed water heater etc.

In case of a trip of the steam turbine, a controlled live-steam bypass to the air-cooled condenser will be utilised to allow continued operation of the boilers. The turbine bypass system will also be active during start-up and shut-down of the boiler, to minimize any water losses (short-time steam blow-off only).

The generator system will be a synchronous generator.

Air cooled condenser

For regular plant operation exhaust steam from the turbine will be condensed in an air-cooled condenser. During start-up, shut-down, overload or trip of the turbine, all or part of the live-steam will flow into the air-cooled condenser via the turbine bypass system. The thermal capacity of the air-cooled condenser will be sufficient to operate with an ambient temperature as high as 35°C.

Air and non-condensable gases entering the steam turbine and steam circuit will be extracted from the steam space of the condenser. The service evacuation will be carried out with a two-stage steam jet ejector, condensed steam being returned to the condensate tank. The motive steam for the ejector will be taken from the HP steam distributor and air extracted by the ejector vented to atmosphere.

A single-stage steam ejector will be used for start-up evacuation. Motive steam for the ejector will be taken from the HP-steam distributor and steam and air extracted by the ejector vented to the atmosphere.

Feed Water System

The feed water systems will consist of the de-aerator/feed water tank, feed water pumps and associated pipes/valves. The system will provide the boiler with de-aerated water and spray cooling water for the boiler de-superheaters. It will also serve the High Pressure (HP) – Low Pressure (LP) steam pressure reduction station.

High Pressure (HP) Steam System

High pressure steam produced by the boiler during normal operation will be taken for electrical energy production by the turbo genset. The HP-steam system will consist of the live steam piping from the boiler to the HP-header (collector), HP-header, piping from HP-Header to the turbine, piping from HP-header to the air cooled condenser via the turbine bypass station, piping from HP-header to LP-header via the steam pressure reduction station (HP/LP) and piping from HP-header to the main and start-up steam-jet air ejectors.

Low Pressure (LP) Steam System

The LP steam system will supply steam to the de-aerator/feed tank, the low pressure feedwater heater and the air pre-heaters. When the turbine is operating LP steam from the turbine will be supplied from the turbine bleed pipe to the LP-header: when the turbine is not operating, LP steam will be supplied from the HP-header via the steam reduction station (HP/LP) to the LP-header.

Condensate System

The condensate system will consist of main condensate tank, condensate pumps, steam ejector condenser, LP condensate heater, piping for condensate coming from the air-cooled condenser via the two condensate pumps, ejector condenser, LP condensate heater to the de-aerator, condensate piping from ejector condenser and LP condensate heater to the main condensate tank.

Drainage condensate from the low pressure system and air pre-heaters will be collected and returned to the system.

Make-up water for steam generation will be taken from the public water supply and treated prior to use in the boiler. Steam will be condensed and recycled to the boiler. Cooling water will not be required as steam will be condensed using the air-cooled condenser, capable of taking the full boiler load to allow continuous operation of the ERF Plant.

Gas Cleaning

Flue gases will pass from the boiler to the gas cleaning equipment to neutralise acid gases. Activated carbon will also be utilized to adsorb primarily dioxins, other volatile organic compounds (VOCs) and mercury. The dry abatement process using either hydrated lime or sodium bicarbonate can be considered to be BAT for Newhurst ERF in that both achieve a high degree of performance. Consequently, selection of the treatment technique is being discussed with technology providers in the current procurement process.

The $DeNO_x$-process for abatement of nitrogen oxides (NO_x) will be achieved using selective non-catalytic reduction (SNCR). SNCR will be based on selective non-catalytic reduction of NO_x in the gaseous phase using ammonia, obtained from a 25% ammonia or urea water solution injected into the furnace chamber. Reduction will take place within a temperature range of 900-950°C, which will exist in the boiler in the radiation zone of the first boiler pass.

As a result of optimised flue gas flow in the first pass of the boiler a high removal efficiency of NO_x and low excess of NH_3 would be guaranteed. This would result in:

- well controlled emissions of NO_x; and
- optimised consumption of ammonia reagent, as experienced in a number of realised plants.

A NO_x Abatement Review is included as Appendix BATOT12.

Bag filters will be used to remove fine ash plus excess/spent reagent and carbon as the gases pass through the bag filter fabric. Build-up of these particulate materials on the bag fabric will enhance performance of the system. Pulses of compressed air will be used to remove the accumulated residues from the bags. The Air Pollution Control Residues (APCRs) will be conveyed to either a storage silo or back into the flue gas via the recirculation system. The recirculation system will allow any unreacted reagent in the APC residues to be recycled back to the flue gas, via a reactivation step, for further contact with acid gases.

The fabric filter will comprise multiple chambers with pressure impulse cleaning units. Each chamber could be isolated from the flue gas flow using pneumatic powered dampers.

The cleaned gas will be discharged to atmosphere via a 96.5m high stack, at an efflux velocity above 22.32m/s when operating at 110% of fuel throughput.

Ancillary Operations

A demineralisation plant will provide demineralised water to compensate for boiler blow down and other cycle losses. Regeneration effluent will be re-used in the bottom-ash discharger. Water for fire-fighting will be stored in tank(s) and will have a dedicated pump(s).

The demineralisation plant will be designed for a continuous supply of demineralised water. The demineralisation plant will comprise two demineralisation lines i.e. duty/standby, and include pre-treatment equipment followed by reverse osmosis vessels, as well as a demineralised water storage tank and pumps.

Ash Handling

Ashes produced during the incineration process will comprise incinerator bottom ash (IBA), boiler fly ash (FA) and residues from flue gas treatment (APCr).

IBA and FA will be collected and combined within the ERF building and conveyed to the IBA facility. IBA will be transported from the boiler hall to the bottom ash storage area using conveyors. IBA from the chain slag expeller will be transported to a separator (“bottom ash scalper”), which will consist of a grid where coarse IBA will be separated and stored in a container. The other part of the IBA will be transported further on belt conveyors to the bottom ash storage area.

The IBA facility will allow enclosed storage and loading of the anticipated IBA to be produced by the plant. Quarterly sampling of IBA will be carried out by measuring the total organic carbon in the residual ash to ensure effective burn out is being achieved.

Boiler ash, fly ash and residues from flue gas treatment will be collected from the boiler at each stage. A conveyor will collect ash from the second, third and fourth passes of the boiler. The conveyor underneath the second and third pass will be made of high-temperature resistant steel.

In-flow of ambient air to the boiler, as well as by-passing of flue gas, will be prevented by means of double flap valves installed at appropriate locations. APCr will be collected and stored separately in silo(s) will be taken off-site in sealed tankers for disposal at a hazardous landfill.

The floor of the IBA storage area will be sloped to contain any minor moisture separation within the storage bays. Trenches at the building rollup doors will ensure no migration of water and assist with minimizing ash tracking. Any water collected will drain into a wash water storage basin (settling basin) that provides settlement/storage, before re-use on the ash piles or in the boiler ash extractors. The water will be sprayed onto the ash in rare instances if necessary to prevent fugitive dust emission.

Liquid Effluent and Site Drainage

All process water will be recycled within the ERF under normal operating conditions. The building will be designed with a sealed drainage system to contain any potential process water / spills within the building and ensure surface water is not contaminated. Potentially contaminated rainwater from roads, car park and other hard-standing area would be contained by kerbs and collected in gullies before passing through an oil/water interceptor and into the surface water attenuation lagoon to the south of the facility, from where it will be discharged to Shortcliffe Brook.

Foul water will be treated by means of an on-site treatment plant, discharged to sewer or tankered off site to a suitably licensed facility, as necessary.

Emissions Monitoring

Emissions from the stack will be continuously monitored for: particulates, carbon monoxide (CO), ammonia (NH_3), sulphur dioxide (SO_2), hydrogen chloride (HCl), oxygen (O_2), nitrogen oxides (NO_x) and volatile organic compounds (VOC). In addition periodic sampling and measurement will be carried out for metals (cadmium (Cd), thallium (Tl), mercury (Hg), antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni), vanadium (V)), dioxins and furans and dioxin-like PCBs. Periodic measurements will be carried out four times in the first year and twice per year thereafter.

A Continuous Emission Monitoring (CEM) system will be provided for each incineration line, whether there are one or two lines.

2.0 MANAGING THE ACTIVITIES

2.1 General Management

Biffa have a documented environmental policy and environmental management system (EMS) in place for a range of sites across the UK.

The Environmental Policy Statement is appended in Appendix BATOT1.

Accreditation to ISO14001 enables development of environmental initiatives within a framework. The details of the environmental management system are laid down in the Environmental Manual. The system is documented and administered through Biffa's ISO 9002 Quality Management Systems.

Prior to operation of the ERF Biffa will develop an EMS specific to the ERF operations and will seek accreditation to IS0 14001 within one year following the completion of ERF commissioning.

Performance against the management system and the Environmental Permit will be audited at regular intervals.

2.2 Suitably Qualified Personnel

The Newhurst ERF facility will operate 24 hours a day 7 days a week. In addition to generating permanent jobs, the site will provide further contract/temporary employment. The staffing level will include site personnel, clerical, maintenance and management staff. The management structure for the Newhurst facility is shown in Appendix BATOT2 of this document.

The management structure, responsibilities and resources will be satisfactory to ensure that the facility operates efficiently, that conditions of the Environmental Permit and EPR 5.01 guidance are met and that continuous maintenance cover will be available 24 hours a day. Biffa's EMS for the Newhurst ERF will detail environmental management control responsibilities and procedures for key staff.

The facility will be managed by a sufficient number of staff competent to operate the site to minimise pollution. Staff will have clearly defined roles and responsibilities.

The management procedures contained within Biffa's EMS will ensure that key posts, such as site operatives, supervisors, management and contractors and those purchasing equipment and materials, demonstrate the necessary competency.

2.3 Training

Relevant staff will undergo training before and during the commissioning process to ensure they are fully aware of how to maintain optimal plant performance and operate in accordance with the Environmental Permit. This training will include awareness of the potential environmental impacts of the plant under normal and abnormal conditions and how to respond, both in terms of plant control and contacting the relevant authorities.

Training during commissioning will be further enhanced by the training of all staff in accordance with Biffa's EMS. This will detail environmental management control responsibilities and procedures.

Any contractors enrolled on site will receive suitable training for health and safety and environmental risk. This will include permit to work systems, method statements and relevant site supervision, all of which will need to be agreed and formally approved prior to commencement of works.

Where industry standards or codes of practice for training exist, they will be complied with.

2.4 Maintenance

Biffa acknowledges that poor maintenance can be the cause of environmental incidents. Due to the potential for the failure of plant or infrastructure (hard-standing, bunds etc) at the site to lead to fugitive emissions to the environment, Biffa will carry out a programme of Planned Preventative Maintenance (PPM). All items of plant and equipment will be regularly inspected and maintained in accordance with Biffa's EMS and / or Manufacturer's specification of programme of plant maintenance.

In addition, all vehicles used on site as part of the operations will be kept in good working order, will be refuelled in accordance with site operational procedures to prevent any fuel spillage and will be driven only by suitably qualified members of staff.

2.5 Accident Management

Biffa recognises the importance of the prevention of accidents that may have environmental consequences and that it is important to limit those consequences. Biffa will develop a system to identify, assess and minimise the environmental risks and hazards of accidents and their consequences as part of their EMS.

Staff will have the responsibility to report all conditions that could result in a potential environmental accident. Key staff will meet several times per year to review potential environmental incidents and the requirement for control. Environmental support staff will be in frequent contact with the site manager to discuss potential concerns. Staff training will take place (as detailed in above) to ensure that all staff are aware how to operate the facility correctly.

The EA will be advised of incidents that are likely to result in a breach of permit conditions, or to have a significant impact on the environment including accidental releases due to spillage or abnormal operating conditions.

As the activity to be undertaken at the site is listed in Schedule 1 of the Environmental Permitting (England and Wales) Regulations 2016, the plant design is likely to undergo a Hazard Operations and Operability Study (HAZOP) during the detailed design stage, which will identify the hazards resulting from potential malfunctions in the process. The purpose of this HAZOP will be to systematically assess the plant and its operation through deviations from the intended design, and any subsequent consequences. As a result, any hazards or operability issues that are uncovered will lead to the identification of the need for appropriate corrective measures.

The requirement for an Accident Management Plan will be incorporated into the EMS. The Accident Management Plan will be reviewed at least every four years or as soon as practicable after an incident with changes made accordingly to minimise the risk of occurrence.

2.5.1 Accident Management Plan

The following Accident Management Plan (Table 1) is a summary of the techniques proposed to minimise the risks to the environment. Activities affecting the health and safety (H&S) of operatives, contractors and visitors will be separately managed in compliance with H&S regulations and company H&S Policy.

The following foreseeable accidents have been identified;

- spillages and leaks or loss of containment from vessels storing fuel oils and dangerous / hazardous substances or water resulting from fire-fighting operations;
- transfer of substances / overfilling of vessels;
- unexpected reactions or runaway reactions;

- failure of mains services;
- operator error/ failure of equipment;
- fire;
- incompatible substances coming into contact/unwanted reactions;
- vandalism/unauthorised access; and
- flooding

The facility will undergo a HAZOP to ensure that as far as practicable any accidents with the potential to cause damage to the environment or human health are reduced or eliminated though appropriate measures being taken in the design of the facility.

Biffa's EMS will incorporate a system for recording all incidents, complaints and near misses at the facility and any results following investigation. The system will be designed to prevent the re-occurrence of any incident through implementation of improved systems.

Table 1:
Accident Management Plan

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Consequence**	**What is the overall risk**
What has the potential to cause harm?	**What is at risk what do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? – Who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains? The balance of probability and consequence**
Loss of containment or spillage of fuel oil. Including over filling and transfer of fuel oil.	Surface water (Shortcliffe Brook) and groundwater.	Direct run-off from site across ground surface, infiltration and via surface water management system.	Fuel storage tanks will be bunded and fitted with high level alarms. Spill kits will be kept on site. Internally the site will benefit from impermeable surfacing with sealed drainage to retain any internal spills. Spill kits will be employed and any waste from a spill will be sent off site to a suitably licensed facility for disposal. Should the spill reach external areas, the surface water attenuation lagoon will be provided with cut off valve(s) to isolate the system in the event of a spill and prevent discharge to the Shortcliffe Brook. Appropriate training will be provided. The Site Manager will be responsible for implementing risk management measures.	Low – due to risk management measures.	Possible contamination of land, surface and groundwater.	Not significant.
Loss of containment or spillage of oils and grease used in maintenance activities. Including over filling and transfer of oils and greases.	Surface water (Shortcliffe Brook) and groundwater.	Direct run-off from site across ground surface, infiltration and via surface water management system.	There will be only a limited volume of oils & greases stored in appropriate dedicated storage areas in small containers with suitable segregation. Spill kits will be held on site. Internally the site will benefit from impermeable surfacing with sealed drainage to retain any internal spills. Spill	Low due to limited quantities stored & containment measure in place.	Possible contamination of land, surface and groundwater.	Not significant.

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Consequence**	**What is the overall risk**
What has the potential to cause harm?	**What is at risk what do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? – Who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains? The balance of probability and consequence**
			kits will be employed and any waste from a spill will be sent off site to a suitably licensed facility for disposal. Should the spill reach external areas, the surface water attenuation lagoon will be provided with cut off valve(s) to isolate the system in the event of a spill and prevent discharge to the Shortcliffe Brook. Appropriate training will be provided. The Site Manager will be responsible for implementing risk management measures.			
Unexpected reactions or runaway reactions.	Humans, groundwater and surface water.	Land, air and runoff to surface water and groundwater.	Hazardous wastes will not be accepted on site and site staff will be given appropriate training if handling potentially dangerous or incompatible substances. All potentially polluting substances will be stored correctly. Continuous emissions monitoring equipment will be in place with ancillary back-up systems to monitor conditions of the plant. Appropriate training will be provided. The Site Manager will be responsible for implementing risk management measures.	Low.	Deterioration of air quality or production of harmful substances which could cause fire or damage health of those exposed.	Not significant.
Operator error/ failure of equipment.	Humans, groundwater and surface water.	Land, air and runoff to surface water and groundwater.	Procedures and action plans will be in place to deal with such an occurrence. All equipment will undergo planned preventative maintenance and be	Low.	Possible contamination of air, land, surface and groundwater.	Low to Medium.

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Consequence**	**What is the overall risk**
What has the potential to cause harm?	**What is at risk what do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? – Who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains? The balance of probability and consequence**
			maintained and checked as per manufacturers' instructions. Full training will be given to personnel. Abnormal operations procedure will be implemented. Appropriate training will be provided. The Site Manager will be responsible for implementing risk management measures.			
Furnace Control Failure.	Humans, local land quality.	Land and air.	On detection of any failure of furnace controls the plant will generate appropriate levels of alarm and a safe plant shut down will be initiated. The risk to humans and local environment are considered low since the waste is contained and already burning on the grate. The waste will be allowed to burn down naturally and the off gases raised to a minimum 850degC in the secondary combustion zone. Should the automatic control for the after burner fail then it will be possible to fire the burners in manual control. Should the failure cause a disruption which generates an ash with higher than allowable carbon content then this will be returned to the grate when the fault has been rectified and the plant returned to normal operating and regulated conditions.	Low	Possible short term excursion of CO emissions to air which will be monitored via the CEMs.	Not significant
Loss of containment or	Local land quality,	Direct run-off from	Reagent will be stored correctly and	Low.	Land pollution	Not significant.

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Consequence**	**What is the overall risk**
What has the potential to cause harm?	**What is at risk what do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? – Who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains? The balance of probability and consequence**
spillage of reagent (or Lime).	surface water and groundwater.	site across ground surface, infiltration and via surface water attenuation lagoon.	labelled. Internally the site will benefit from impermeable surfacing with sealed drainage to retain any internal spills. Spill kits will be employed and any waste from a spill will be sent off site to a suitably licensed facility for disposal. Should the spill reach external areas, the surface water attenuation lagoon will be provided with cut off valve(s) to isolate the system in the event of a spill and prevent discharge to the Shortcliffe Brook. Appropriate training will be provided. The Site Manager will be responsible for implementing risk management measures		resulting in alteration of soil pH. Pollution of surface water resulting in negative effects such as fish kill.	
Loss of containment or spillage of Hydrochloric Acid, Ammonia solution and other raw materials used in the process.	Local land quality, surface water and groundwater.	Direct run-off from site across ground surface, infiltration and via surface water attenuation lagoon.	Hydrochloric Acid will be stored in limited quantities (as required). Tanks will be located in bunded areas and placed on hard standing. Mitigation measures will be as described above for Hydrochloric Acid. Appropriate training will be provided. The Site Manager will be responsible for implementing risk management measures.	Low.	Health effects to site workers as hazardous properties, pollution of surface and ground water toxic to aquatic life	Not significant.
Fire	Air, water and land.	Air transport of smoke, spillages and contaminated firewater by direct run off from site	The measures taken to prevent and minimise the potential impact of fire within the proposed ERF facility are described in the Fire Prevention Plan (FPP) submitted with this variation application, Ref:	Low.	Harm and nuisance to local population, emergency services and site staff.	Not significant.

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Consequence**	**What is the overall risk**
What has the potential to cause harm?	**What is at risk what do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? – Who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains? The balance of probability and consequence**
		and via surface water attenuation lagoon.	413.00034.00562/FPP. The Site Manager will be responsible for implementing risk management measures.			
Incompatible substances coming into contact/ unwanted reactions.	Air, land, surface water, groundwater and humans.	Land, air, ground and surface water.	Hazardous wastes will not be accepted on site and site staff will be given appropriate training if handling potentially dangerous or incompatible substances. All potentially polluting substances will be stored correctly. Continuous emissions monitoring equipment will be in place with ancillary back-up systems to monitor conditions of the plant. Appropriate training will be provided. The Site Manager will be responsible for implementing risk management measures.	Low.	Deterioration of air quality or production of harmful substances which could cause fire or damage health of those exposed.	Not significant.
Vandalism/unauthorised access causing loss of containment or fire.	Local population, staff, fire fighters; respiratory irritation, illness & nuisance. Pollution of water or land with firewater. Local land quality, surface water and groundwater.	Land, air.	The site will benefit from CCTV, fire alarms systems and will be securely fenced and provided with security lighting as appropriate. Appropriate training will be provided. The Site Manager will be responsible for implementing risk management measures.	Low.	Harm and nuisance to local population, emergency services and site staff. Contamination of land and surface water.	Not significant.
Flooding	Land and surface water.	Flood waters over land.	Containment measures will be in place along with appropriate drainage measures.	Low.	Contaminated flood waters may contaminate	Not significant.

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Consequence**	**What is the overall risk**
What has the potential to cause harm?	**What is at risk what do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? – Who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains? The balance of probability and consequence**
			A Flood Risk Assessment has been included as part of the planning application (403.00034.00308/FRA). The Site Manager will be responsible for implementing risk management measures.		buildings and land.	

2.6 Incidences and Non Conformances

Biffa will have in place procedures to account for the potential for incidents and non-conformances which may affect the environmental performance of the facility. The procedures (contingency action plan) will set out how any abnormal operation including malfunction, breakdown or failure of plant, equipment or techniques will be dealt with to ensure that normal operation of the facility is regained promptly.

As a minimum procedures will set out how Biffa will;

- detect abnormal operation and investigate the causes;
- assess the information and decide on the appropriate course of action;
- retain normal operation in the short term;
- prevent against the reoccurrence of the problem in the long term;
- set out an official complaints procedure for the general public.

As will be detailed further in Biffa's EMS, the procedures will ensure that non-conformances are reported, investigated and rectified, and that failures and weaknesses are prevented.

Biffa's EMS will provide a means for the management system and the environmental performance of the facility to be evaluated. This will be accomplished through regular internal audits and accredited external auditors and will include, where appropriate, the identification of areas where improvements are required. The regular review of the EMS and its procedures will form an essential role in ensuring that the systems and procedure remain appropriate to the site activities and legal requirements (including compliance with the Environmental Permit) throughout the life time of the ERF facility.

To assist in the reporting of incidences, Biffa will display a notice at or near the site entrance with the following information clearly visible;

- company name;
- permit number;
- emergency contact name and the permit holders (i.e. Biffa) telephone number;
- a statement that the site is permitted by the Environment Agency;
- Environment Agency national number (08708 506506) and incident hotline number (0800 807060).

2.7 Control of Major Accident Hazards (COMAH) Regulations

It is not anticipated that the operations will require the storage of any materials specified in the Control of Major Accident Hazards (COMAH) Regulations in quantities above qualifying thresholds. Consequently the COMAH Regulations are not applicable to the proposed operations.

2.8 Energy Efficiency

Energy will be managed and reviewed at least every four years as one of the significant environmental aspects of operation as part of Biffa's energy procedure. The purpose of the procedure is to reduce energy usage within the Biffa group.

The ERF at Newhurst Quarry has been designed as a CHP plant, generating both electricity for net export to the National Grid and heat for local end users. It is anticipated that the facility will therefore be a net exporter of energy. However, Biffa will operate and maintain the facility with a view to the efficient use of energy where required. The facility is new and therefore the opportunity exists for Biffa to select technologies (for example, air conditioning and cooling systems, feed water heating systems, heat recovery systems, boilers, and insulation/containment methods such as doors) with high energy efficiency.

Heat created during the incineration process will be recovered as efficiently as possible via the steam boiler. The ability exists to recover waste heat and further details are described in the previously submitted Heat Plan.

It should be noted that the proposed facility will not achieve the full design output of power and heat for a considerable period once construction is completed. The facility will undergo an extensive period of commissioning and testing before it is able to undertake its contractual guarantee performance tests. Once fully commissioned the plant will undergo prescribed guarantee tests that will allow discharge of contractual obligations leading eventually to hand-over of the facility to Biffa.

During these periods, power and heat production will vary, as parts of the process are tested under a range of operational conditions etc. Subsequent to hand-over a period of trouble-shooting is likely to be involved, dealing with minor issues that require resolution to comply with contractual requirements. Once again output of power and heat will vary as issues arising are dealt with. Limited availability of waste and continuing operator training and familiarisation with the plant are also likely to limit full output from the plant being achieved for a further period of time. For these above reasons it is not expected that the facility will achieve its design output of power and heat until fully commissioned and operational.

In line with the conditions of the Environmental Permit Biffa will take appropriate measures to ensure that energy is used efficiently at the site. Biffa will review and record, at least every 4 years, any opportunities to improve the energy efficiency of the activity and take appropriate measures.

Energy will be used at the following stages of the process;

- mains electricity during start-up and shut-down;
- gas oil for use in auxiliary burners;
- parasitic demands of fuel preparation process machinery (e.g. motors, control systems);

A breakdown of delivered and primary energy consumption has been estimated below in Table 2. Delivered and primary energy consumption will be confirmed once the detailed design has been finalised.

Table 2:
Delivered and Primary Energy Consumption Estimates

Energy Source Delivered (MWh)	Energy Primary (MWh)	% of Total
rMSW + C&I wastes	1,011,120	99.13
Electricity - Mains	1,300	0.13
Gas Oil (start up/shut down only)	7,583	0.74
TOTAL		100
Net Exported Energy	**MWh**	
Electricity	300,000	30.0

Biffa will undertake to review energy usage on the site on a regular basis and will produce an energy efficiency plan that identifies CO_2 savings of each potential measure. This is likely to include;

- identification of the energy efficiency measure;
- CO_2 savings (tonnes);

- equivalent Annual Cost (EAC) £k;
- EAC/ CO_2 saved £/tonne;
- date for implementation

An extensive Planned Preventative Maintenance programme will be implemented at the installation to ensure that plant is able to operate at optimum conditions. Items covered under this programme will include:

- motors and drives;
- compressed air systems;
- steam systems; and
- lubrication systems

In addition to regular and routine visual inspections of the above systems by site operatives, formal inspections by management and the preventative maintenance regimes will help to optimise energy consumption at the installation.

Basic low-cost measures will be implemented at the installation, such as seals and self-closing doors and fitting simple control systems such as timers and sensors to heating/hot water systems. Steam and hot water pipes will be fully insulated and access doors to the main plant and buildings will be closed when the plant is non-operational to prevent space heating losses.

In terms of energy-efficient building services, the building has been designed according to the BREEAM rating scheme. Energy losses from the building will be minimised through a number of approaches, including: insulation of appropriate process equipment, design of building fabric; use of energy efficient lighting, heating, ventilation and cooling.

The following energy efficiency techniques will be employed at the site;

- parasitic electrical loads will be provided from power generated by the facility but most electricity generated would be exported to the National Grid;
- the potential exists for waste heat to be used in Community Heating schemes for local housing or business. The steam turbo-generators will be designed to allow the CHP option to be developed in accordance with demand;
- furnace sections and all pipework handling process steam and air heaters will be insulated as necessary in order that the external temperature of the surface does not exceed a temperature safe for personnel and ensure that heat losses are minimised;
- all combustion and air handing equipment include seals to ensure controlled ingress of air or to prevent escape of combustion gases etc. A routine maintenance programme will ensure effectiveness of door/hatch seals etc. Pre-preparation of waste feed by mixing and removing contraries, will ensure smooth furnace operation, reducing downtime due to poor fuel characteristics and concomitant combustion problems;
- auxiliary burners provided to maintain constant temperature, along with tight controls on combustion conditions;
- at the detailed design stage where possible layout of the facility will take advantage of gravity to minimise need to pump/transfer materials around the site.

An energy management system will be implemented to allow measurement and monitoring of the energy flows around the plant. The data will be monitored against targets to ensure that the plant is operating at optimum conditions and to enable further areas to be targeted for reduction.

Whilst Biffa has certain obligations in relation to the Climate Change Levy Agreement (CCA), Biffa is not a participant in a CCA. An assessment of the Global Warming Potential of the process is presented in Appendix BATOT4 to this document.

In summary, the Newhurst ERF facility will help reduce UK methane emissions by using a thermal process to treat the region's residual waste stream, thereby avoiding disposal to landfill of active waste. The thermal treatment process with energy production reduces significantly the volume of waste and will have the ability to recover the energy content within the waste.

Summary of Compliance with Indicative BAT on Energy Efficiency Techniques

- Use of heat generated by this new installation both for the plant and for supply to the external electrical grid (approximately 38MWe net for export to the National Grid) - it is expected that the facility will be a net exporter of energy;
- Use of higher efficiency electrical generation technology in the form of a steam turbine turbo-generator set;
- Potential for use of waste heat for CHP heating;
- In CHP mode the net power exported may reduce marginally but will result in a significantly higher overall efficiency of the system
- Use of plant generated heat for preheating combustion air and boiler feed water;
- Effective furnace and pipework insulation and construction to retain heat, e.g. refractory linings;
- Maintaining steady plant capacity to prevent unscheduled downtime, e.g. through waste pre-treatment - the ERF facility will operate continuously on a 24-hour, seven days per week basis;
- Effective preventative maintenance of heat exchangers to maintain high heat transfer;
- Prevention of uncontrolled air ingress by providing and maintaining seals;
- Ensuring plant layout makes use of gravity to avoid pumping and heavy transfer where possible; and
- The siting of plant near to potential or actual energy users will aid the maximisation of recovery potential.

2.9 Efficient Use of Raw Materials

Biffa will take appropriate measures to ensure that raw materials are used efficiently, and will maintain records of raw materials used on site. Materials used on site will be recycled and re-used, wherever possible.

Where possible, raw materials that minimise environmental impact will be selected. Consideration will be given to such factors as degradability, bioaccumulation potential and toxicity.

A regular review will be undertaken to ensure raw materials are appropriate for use, consumption optimised and opportunities for reduction of use and improvements identified. Alternative raw materials will be evaluated for their environmental impact on an ongoing basis and subject to specific quality requirements; substitution will be given appropriate consideration.

An estimated raw materials inventory is detailed in Table 3 below. Any additional raw materials will be recorded and assessed for their environmental impact prior to use.

Relevant Materials Safety Data sheets will be held by the Site Manager and located at the facility. Raw materials will be reviewed periodically to identify potentially safer alternatives. Where appropriate such alternatives may be trialled or tested to further reduce potential environmental impacts. Where less harmful alternatives are identified as potentially suitable, studies and trials may be undertaken to determine actual feasibility. Where appropriate, these would be undertaken in conjunction with the EA.

All chemicals will be stored in drums, sacks or other suitable containers on sealed surfaces within contained areas or structures. Raw materials will be stored indoors in designated, bunded areas to minimise environmental risks. These areas will be clearly marked and maximum storage capacities clearly stated.

Internal procedures, comprising purchasing of materials from approved suppliers and periodic checks, will ensure raw materials are appropriate for use in the process.

Summary of Compliance with Indicative BAT on Efficient Use of Raw Materials:

- Plant will be designed and will be managed and operated that will take account of waste heterogeneity;
- Techniques to improve feedstock heterogeneity will be considered for example upstream waste management, producing procedures for removal of problem wastes and considering on or off site waste mixing; and
- Alkaline reagent use will be optimised to help prevent the production of wastes reagent.

Table 3: Principal Raw Materials and Estimated Inventory

Raw Material	Use	Storage/ Containment	Maximum Amount Stored on Site at Any One Time	Annual Throughput	Chemical Composition	Fate of Material	Alternatives
MSW and C&I waste	Generate energy from the waste.	Storage within the waste bunker	Approximately 5200 tonnes	350,000 tonnes	MSW and C&I waste	Land/air	None. The purpose of the facility is to divert from landfill and generate energy from the waste.
Quick or Hydrated Lime	Reagent for acid gas treatment	Cylindrical carbon steel silo, pneumatic filling by lorry, with bag filter for exhaust air and safety valve	450m^3	5,500 tonnes	Lime (CaOH)	Land	None unless process is modified to accept lime
Ammonia or Urea solution	Reagent for NO_x reduction	Storage tank 40m^3.	40 m^3	800 tonnes	NH_4OH 25 % w/w	Water	Urea Prills
Activated carbon	Reagent for dioxin / heavy metal adsorption	Cylindrical carbon steel silo, pneumatic filling by lorry with bag filter for exhaust air and safety valve, safety system with inert gas injection	80m^3	175 tonnes	Carbon (C)	Land 100% (Landfill)	Injection of carbon is a fundamental technique for reducing emissions from the stack and is considered BAT (and is the only effective reagent for reducing heavy metals and dioxins).
Fuel oil	For auxiliary burners	Storage tank	80m^3	150,000 tonnes	35 sec fuel Oil	Land	Natural gas (though no mains gas available).
Oil and grease	For maintenance of auxiliary plant	Storage tank	0.5m^3 of oil and 500kg of grease.	0.5m^3 of oil and 500kg of grease.	Oil	Land	None
Boiler Water Treatment Chemicals	For use in Boiler	As appropriate	TBC at the commissioning stage following choice of Boiler	TBC	TBC	TBC	TBC

2.10 Efficient Use of Water

With regard to the potential to reduce use of water Biffa will consider the following techniques;

- use of water efficient techniques at source;
- recycle water within the process;
- possible use of uncontaminated roof and surface water for irrigation;
- separate contaminated and non-contaminated streams of water;
- direct measurement of fresh water consumption at a significant usage point;
- consider vacuuming, scraping or mopping in preference to hosing down;
- use of trigger controls on all hoses and washing equipment; and
- utilisation of an air-cooled condenser for plant heat rejection as opposed to cooling tower.

Any process water generated will be recycled where possible. An indicative water use diagram showing the estimated water consumption by different activities around the installation is provided in Appendix BATOT5.

Reuse and recycling of water around the site will be implemented wherever possible. For example process water will be used for quenching bottom ash.

Water usage will be subject to continual review, including the evaluation of options for reuse and recycling.

Due to the installation layout and plant controls, routine cleaning will be minimal (although some wash down will be required). Where spillages / clean down is required, dry methods of cleaning will be used preferentially over high pressure lower volume spray guns or over unpressurised hoses.

Water consumption is not expected to be significant. Consumption will be monitored on a regular basis and these data will be used as part of the ongoing review of water efficiency and the water minimisation audit.

Effluent treatment to a standard sufficient for use in the boiler system is not economically viable due to the high level of purity required and the relatively low volumes of water used. However, process effluents such as boiler blow-down and regeneration water from the demineralisation plant may be reused in the ash quench, with no process effluent routinely being generated for off-site discharge. Alternatively, boiler blowdown maybe treated and reused, avoiding off-site discharge.

The site will require a connection to sewer for the discontinuous discharge of process water during maintenance or upsets in the operation. During commissioning the initial process water from the boiler will be taken off site via tanker. Once operational, the site will undergo scheduled boiler shutdowns that may require a discharge to sewer under the conditions of a Trade Effluent consent obtained from the sewage undertaker. If a sewer connection is not available boiler water will be tankered off site to a suitably licensed facility.

Summary of Compliance with Indicative BAT on Efficient Use of Water

- Quantity of water usage to be monitored;
- Preferential use of dry scrubbing systems;
- Recirculation of water where possible, e.g. process water will be used for quenching bottom ash;
- Use of trigger controls on all hoses and washing equipment;
- Direct measurement of fresh water consumption;
- Separate contaminated and non-contaminated streams of water;

- Use of an air-cooled condenser for facility heat rejection; and
- Use of uncontaminated site drainage and run-off water in the process.

2.11 Waste Minimisation Audit

Biffa will review and record every 4 years whether there are any suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of raw material and water usage and will take any appropriate further measures identified by a review.

The first waste minimisation audit will take place within two years of the facility becoming operational and results will be made available to the EA. The audit will consider the following;

- process mapping;
- materials mass balance; and
- action plan for agreement with the EA.

A full water minimisation audit will be undertaken within 2 years of receipt of the permit, reviewing all users and identifying options for reducing water consumption. The audit will consider the following;

- inspection of pipework;
- establish water efficiency objectives, based on benchmarks in sector specific guidance or the relevant BAT Reference (BREF) note;
- identify constraints on reducing water use beyond a certain level;
- consider use of water pinch techniques to identify opportunities for maximising reuse and minimising use of water;
- establish the water quality needs of each use to identify opportunities for recycling; and
- action plan for agreement with the EA.

2.12 Avoidance, Recovery and Disposal of Wastes

Biffa will take appropriate measures to ensure that waste produced by their activities is avoided or reduced and recovered wherever practicable. If recovery is not possible, then Biffa will ensure that waste is disposed of to an appropriate licensed facility.

The facility will produce a variety of waste streams of which the following process by-products form the most significant;

- Incinerator Bottom Ash (IBA), includes boiler FA;
- Air Pollution Control Residues (APCR); and
- recovered waste fractions i.e. metals (recovered offsite).

An updated Residue Management Plan (reference 413.00034.00562/RMP) describes how Biffa will aim to limit the amount and harmful effects of these residues and describes how they will be recycled where appropriate.

At present it is envisaged that APCR will be disposed of at a hazardous facility. However, Biffa will review this on an ongoing basis and look into the possibility of sending APCR off site for use in a further process.

Smaller quantities may also be produced from the facility including;

- rejected feedstock;
- parts replaced as a result of malfunction or routine maintenance;
- packaging waste associated with replacement parts;
- containers for oils and other substances used to ensure the efficient operation of plant; and
- domestic waste from the site office and on site facilities.

Records will be kept on site of wastes generated including type, quantity, source and management option taken. All waste will be dealt with in accordance with the Environmental Protection (Duty of Care) Regulations 1991, and the Environmental Permitting (England and Wales) Regulations 2016, and where appropriate with due regard to the Hazardous Waste (England and Wales) Regulations 2005.

Biffa will develop procedures for the disposal of waste generated by the site and in the process will identify suitable local facilities that will be able to accept the waste. Where possible site generated waste will be recycled. Procedures will include ensuring that the appointed waste carrier has the correct registration certificate and that a waste transfer note is completed.

Biffa will regularly audit waste management options through its EMS. This process will also highlight waste prevention and waste minimisation opportunities at the site.

Waste will be stored in suitable sealed storage facilities in a designated area of the site until removal by a specialist contractor. Where appropriate, waste will be segregated to allow for recycling.

Waste parts, associated packaging and contaminated solid materials (e.g. filters) will be stored in suitably sized containers located on drip trays or within a drum storage area. Disposal will be carried out by a specialist contractor. Solid waste will be stored in skips or similar vessels. Liquid waste will be stored in suitable containers within a bunded area.

Waste oil will be disposed of off-site by a specialist contractor to an appropriately permitted facility. If possible empty drums and containers will be returned to the supplier for re-use.

Summary of Compliance with Indicative BAT on Avoidance, Recovery and Disposal of Wastes

- Ash will be stored and transported in a manner that prevents fugitive dust releases;
- Waste acceptance procedures will help to minimise the delivery of waste that cannot be processed at the facility;
- Provision will be made for the safe storage of rejected loads;
- The aforementioned updated Residue Management Plan (reference 413.00034.00562/RMP) details how Biffa will aim to limit the amount and harmful effects of residues produced and describes how they will be recycled where appropriate;
- Minimise the amount of waste delivered that cannot be processed at the facility; and
- Recover waste where practicable – if recovery is not possible, ensure that waste is disposed of to an appropriate licensed facility. Regularly audit waste disposal/recovery routes to ensure waste is being properly dealt with.

2.12.1 Disposal Options and Controls

Consideration will be given to the most appropriate disposal route for each waste arising, with disposal and recovery being as close to the facility as possible. Where practicable recycling and reuse of materials and equipment/plant will be undertaken.

2.12.2 Monitoring and Reporting of Waste Emissions

Waste emissions will be fully characterised and monitored to ensure that the associated hazards are understood and that risks to human health and the environment are managed appropriately. This will typically comprise an initial detailed analysis to confirm the exact composition of the waste, followed by periodic check testing of key contaminants to ensure that characteristics do not significantly change. In the event of a significant change the waste would be subject to detailed analysis again.

A Human Health Review is included in Appendix BATOT13. This assessment has been updated to reflect the changes proposed in this variation application.

Ash volumes will be monitored through weighbridge tickets, waste transfer notes and consignment notes. Amounts sent to recovery or disposal will be reported to the EA every 6 months.

An IBA and APCR sampling programme is to be agreed with the recipient of the wastes and the EA to ensure that all regulatory requirements are met.

IBA recycling will be kept under review and documented formally at least every four years as part of the overall site waste minimisation review.

2.13 Site Security

In order to prevent unauthorised access to the site, site security measures will be in place.

The facility is considered to be ‘high’ risk, and therefore a high level of security is required. Perceived threats include;

- unauthorised access potentially leading to vandalism to buildings and property, including graffiti;
- organised groups of protestors; and
- individuals or groups intent on malicious damage for example, arson.

The security provided shall be designed on the following principles;

- establish a secure observable line remote from the building to ensure that the building and its operations are safe from objects thrown over the fence;
- a system that is able to detect intrusion into this secure line;
- it shall co-ordinate with Biffa’s Emergency planning guidelines; and
- a system that is able to respond to any intrusion rapidly and effectively in order to prevent any of the threats mentioned above.

The proposed security shall therefore consist of the following components;

- physical barrier at site perimeter in the form of a boundary fence with guard wire;
- adequate external lighting to enable good operation of selected CCTV system; and
- CCTV system to detect breach of the boundary line and subsequent location of intrusion.

All components of the security system shall be designed to meet the ‘high’ level of security required.

The operational area of the site shall be provided with a secure boundary treatment. A non-climb plastic coated weld mesh fence on polyester powder coated standards will be provided. The fence shall be 2.4m tall.

There shall be a number of securable gates in the boundary enclosure as follows:

- main entrance from A512 at north west of site;
- securing access to batching plant at south of site; and
- securing access to quarry from visitor's car park.

2.14 Permit Surrender

At the time that the permit is surrendered the Operator must demonstrate that the site will be returned to a satisfactory state. During the operation of the site therefore Biffa will ensure that emissions to land, air and water are carefully controlled to meet the conditions of the Environmental Permit.

Site investigation records have been included in the Site Condition Report produced for the original Environmental Permit application (reference 407.0034.00332/SCR) which records the condition of the land prior to commencement of operations at the site.

2.15 Displaying the Environmental Permit

Biffa will ensure that all staff and contractors working at the Newhurst ERF facility will have readily available access to a copy of the Environmental Permit governing operations at the site.

3.0 OPERATIONS

3.1 Permitted Activities

The waste management operations to be carried out at the site as detailed in Annex IIB of the Waste Framework Directive are listed below;

R1 Use principally as a fuel or other means to generate energy

The following permitted activities will take place at the proposed ERF facility, as detailed in Schedule 1, Part 2, Section 5.1 Part A(1)(b) of the Environmental Permitting (England & Wales) Regulations 2016;

'Incineration of non-hazardous waste in a waste incineration plant or co-incineration plant with a capacity exceeding 3 tonnes per hour'

The facility will be operated using the techniques and in the manner described in this BATOT document.

The main purpose of the activities at the proposed Installation will be to burn residual Municipal (rMSW) and Commercial and Industrial (C & I) wastes and some RDF to recover energy as steam, which will be used to produce electricity for export to the National Grid.

Reference should be made also to Appendix BATOT10: Questions 1 – 36 of the EP5.01.

3.2 Incoming Waste and Raw Material Management

A list of waste types proposed to be accepted at the facility in accordance with the European Waste Catalogue is shown in Appendix BATOT6.

It is anticipated that wastes will comprise a mixture of non-hazardous rMSW, commercial and industrial wastes, with approximately 10% of Refuse Derived Fuel (RDF). The overall average net Calorific Value (CV) is estimated to be 10.5MJ/Kg, well within the design range of the ERF.

Management of incoming wastes and raw material management will be essential to provide for efficient operation of the combustion plant and to reduce production of residues requiring treatment and disposal.

A number of specific techniques will be employed to minimise the production of residues. All of these techniques will meet the Indicative BAT requirements from the Sector Guidance Note on Waste Incineration (EPR 5.01).

Residual MSW and commercial and industrial wastes will be delivered to the plant by road in covered vehicles. Vehicles will be weighed before proceeding to the tipping hall. The tipping hall will be a fully enclosed building, to ensure no odours, dust or litter escape the building. Vehicles will tip into a waste storage pit from where a grab crane transfers waste to the combustion plant feed hopper. The grab will also be used to homogenise wastes and identify and remove unsuitable or non-combustible items.

Feedstock Homogeneity: improving feedstock homogeneity improves the operational stability of the plant, leading to reduced reagent use and residue production. The process of tipping MSW in the storage bunker and subsequent mixing by the grab cranes serves to improve further the homogeneity of MSW from different deliveries.

Furnace Conditions: furnace conditions will be optimised in order to minimise the quantity of residues arising for further disposal. Burnout in the furnace will reduce the loss on ignition

(LOI) content of the bottom ash to <5% or TOC to <3% by optimising MSW feed rate and combustion air flows. SNCR reagent dosing will be optimised to prevent ammonia slip.

Flue Gas Treatment Control: close control of the flue gas treatment system will minimise the use of reagents and hence minimise the residues produced.

Waste Management: incinerator bottom ash will be temporarily stored and shipped off-site for metals recovery and possible recovery as aggregate. Residues from flue gas treatment will be temporarily stored and disposed of separately.

A number of other materials are used in the operation of the facility.

Quick or Hydrated lime for flue gas cleaning will be stored in a silo. Lime will be delivered by bulk tanker and offloaded pneumatically into one of the silos with displaced air vented through a silo top filter. Activated carbon for the flue gas cleaning process will be delivered by bulk tanker and offloaded into a silo with displaced air vented through a silo top filter. Ammonia reagent will be delivered and stored in a tank for use as needed in the SNCR dosing system. Chemicals for boiler corrosion protection will be delivered in totes, drums or bags.

Water treatment chemicals will be delivered in appropriate containers and stored in bunded areas.

An $80m^3$ bunded gas oil tank will provide oil for the combustion burners and on-site vehicles. Any offloading spillages will be retained in a collection gulley and surface water will be drained via an oil separator to the main drainage system.

Maintenance materials (oils, greases etc.) will be stored in containers and storage areas as appropriate.

Summary of Compliance with Indicative BAT on Incoming Waste and Raw Material Management

- A high standard of housekeeping will be maintained in all areas and suitable equipment to clean up spilled materials will be provided;
- Vehicles will be loaded in designated areas;
- Roofing and drainage segregation will be provided to minimise contamination of rainwater;
- Delivery and reception of wastes will comply with legislative requirements;
- Waste acceptance procedures and procedures for dealing with non-conforming waste will be produced;
- Storage of fuels and treatment chemicals in appropriately bunded tanks or containers;
- Delivery of incoming MSW and commercial and industrial wastes by road in covered vehicles;
- Tipping hall to be fully enclosed with odour control and to avoid dispersal of litter; and
- Use of a grab crane to transfer waste to the combustion plant feed hopper and to homogenise wastes and identify and remove unsuitable items.

3.2.1 Waste Acceptance Procedures

Waste received at the facility will be inspected to ensure a consistent feed is prepared for combustion on the boiler grate.

The waste input will consist of rMSW, C & I wastes and about 10% RDF. Residual MSW will be generated through various Local Authority waste facilities serving the proposed Newhurst ERF plant. As such the rMSW input will be pre-treated waste, having been previously segregated at source by householders or treated and inspected at the Local Authority facilities. Bulky items received on-site will be separated and/or crushed by tipping floor loader prior to discharge into the furnace to ensure feedstock homogeneity.

The ERF has been designed to process incoming waste with a net calorific value (NCV) of between 7.0 MJ/kg and 14.0 MJ/kg. A firing diagram, for a single stream facility, which presents the range of fuels to be combusted within the ERF is presented in Figure 4 of this BATOT document, a two stream facility would provide a comparable operating envelope. The nominal design of the ERF will be 43.33 tonnes per hour with a fuel with an NCV of 10.5 MJ/kg. This is equivalent to approximately 417,000 tonnes per annum, assuming an availability of 8,760 tonnes per annum.

On this basis a front-end Materials Recycling Facility (MRF) is not considered necessary.

As part of Biffa's certified EMS, site specific documented procedures will be provided prior to commencement of operations at the site. These procedures will comply with both IED and Duty of Care legislation.

Computerised weighbridges will be present at the entrance and exit of the facility. The computerised weighing control system will record the following;

- vehicle weights;
- issued transfer ticket numbers;
- tare weights;
- gross weights;
- net weights;
- waste type;
- waste carrier identification;
- vehicle registration; and
- vehicle type.

CCTV cameras will be positioned to view the front and rear of vehicles on each of the weighbridges. Audio visual communication will be provided between the weighbridge and the central control room.

The equipment located at each weighbridge (weighing terminal) will include;

- weatherproof casing;
- electrical heater;
- digital display;
- card reader;
- ticket printer;
- two way intercom system;
- induction loops, entrance and exit barriers; and
- traffic light.

Equipment located in the control room will most likely include;

- one digital weight indicator;
- one complete computer; and
- one printer for summaries / reports.

Wastes will be characterised, as required under the Duty of Care Regulations, prior to acceptance of the delivery. On inspection, deliveries which do not have the required information, will either have to produce the correct information, or will be refused entry to the waste reception hall. Non-conforming wastes will be removed off-site for disposal at a suitably licensed facility. Records of the waste characteristics and origin of the waste will be kept in accordance with Duty of Care requirements.

Wastes will undergo a visual inspection during deposition in the waste reception hall in the refuse bunker. Operational procedures at the site will include specific procedures for waste reception, checking and handling of non-conforming loads/items as detailed in Biffa's EMS for the site. These procedures will be developed to ensure that the requirements of the Duty of Care Regulations, the Environmental Permit Regulations and Waste Incineration Directive (IED) and any other relevant published and finalised legislation are met.

The general physical and chemical composition of rMSW and C & I wastes is well-understood and has been shown to be consistent across a number of operational plants in the UK. The facility is designed to accept rMSW and C & I wastes only and will not treat any waste streams it is not designed to handle. The mass throughput will be controlled automatically to ensure that at all times the system is operated within its design envelope.

3.2.2 Waste Quarantine Procedures

Wastes identified as non-permitted will either be rejected and sent off-site before tipping, or if not identified until after tipping, collected and sent to the designated quarantine area in the tipping hall for future removal off-site.

The waste producer and carrier will be contacted and requested to collect and remove the wastes from site. A record shall be kept of all non-conforming wastes.

3.3 Waste Charging

Charging waste into the combustion unit will involve a number of stages. Essential aspects are ensuring a relatively consistent waste NCV, mass feed rate and control of tramp air into the combustion grate.

The reception area will be enclosed, with rapid access doors to manage traffic and appropriately sized louvered panels to control air movement.

The waste bunker will be housed within the main structure of the building to minimise escape of odours and combustion air drawn from the bunker area. Waste delivered to site will be tipped directly into the waste storage bunker, or onto the tipping floor for inspection if truck contents are questionable. Waste identified beforehand as unsuitable will be rejected and sent off-site.

Traffic lights will be provided at each unloading bay to enable control of traffic flows and avoid congestion.

The waste feed bunker will be designed to provide at least five days of waste storage capacity at the 100% rate of fuel throughput. The minimum tipping bay width will be 6m with seven bays in total, allowing vehicles to unload simultaneously in alternate bays.

Air for the combustion process will be drawn from the waste tipping hall, creating airflow into the building. In addition all delivery vehicles will be covered or enclosed, reducing odour escape during transport.

Bunker management procedures will ensure periodic emptying takes place to avoid anaerobic conditions developing in the waste. Experience at other operational plants suggests that such conditions occur rarely due to the relative dryness of the waste.

Fire-fighting provisions will be provided. Measures will include firewater storage and automatic fire deluge and spray systems to control any fire that may occur. In addition preventative measures related to maintenance and inspection procedures will reduce the risk of fires occurring. The following measures will act to prevent hazards associated with fire at the installation;

- waste bunkers will be constructed from reinforced concrete and fire-retardant and non-flammable materials;
- bunker will act as the drainage sump for the retention of any fire water run-off generated in the reception hall; and
- meetings will be held with the Local Fire Officer when necessary prior to signing off detail design drawings to ensure local requirements are taken fully into account.

Measures to ensure a consistent waste feedstock will include;

- grab cranes operators are trained to remove oversize or unacceptable items from the area; and
- operators will blend refuse collection vehicle (RCV) deliveries to maximise homogeneity of waste feedstock in the reception bunker.

Summary of Compliance with Indicative BAT on Waste Charging:

- firing diagram has been included with this application;
- waste charging is interlocked with furnace conditions so that charging cannot take place when the temperatures and air-flows are inadequate;
- the plug of waste in the feed chute prevents uncontrolled air from entering combustion chamber; and
- a consistent feed will be provided to ensure steady combustion conditions.

3.3.1 Waste Crane and Grab

Two identical waste grab cranes will be designed for fully automatic and manual operation by two operators working from two separate positions. The grab cranes will be designed to mix, stack and cast waste in the bunker, to provide a relatively consistent feedstock NCV entering the incinerator.

The crane will be designed as a bridge crane with a grab trolley, hoisting gear and electro-hydraulic hydraulic motor grab. The crane components will be designed such that the crane system can feed the incinerator and mix the waste in continuous operation.

Operator training procedures will ensure waste is inspected once deposited in the bunker, with non-permitted wastes removed prior to waste entering incinerator feed hoppers and combustion lines. A designated storage area for non-permitted (quarantined) waste, pending removal off-site, will be provided.

The crane will be controlled remotely from the crane operator's pulpit located in the control room. The crane will be equipped with a load measuring system to keep track of the incinerator waste feed rates. The ability to operate efficiently on an inclined refuse surface will be considered when selecting the grapple. The design of the grapple will enable a reasonable filling factor and non-destructive bending of the control and power wiring.

The crane will be designed to automatically totalise the weight of the refuse fed to the incinerator hopper. Operation in dangerous zones, such as in front of the operator's pulpit, will be prevented by hardwired safety limit switches. In addition, the dangerous zones will be considered in the control software that controls both manual and semi-automatic modes.

In semi-automatic mode, once the grab has been loaded by the operator, it will discharge automatically into the pre-programmed feed-hopper. Each crane will be designed to transfer delivered waste into the feed hoppers and will be capable of continuous operation.

The crane will be capable of simultaneous operation in two directions horizontally while raising and lowering the grab vertically. Whilst a load-cell based weighing system will enable recording of the weight of each grab load before discharge into the feed chute, this data is not reflective of the weight charged to the boiler because of fluffing waste by hopper side spillage.

Waste will be transferred from the storage bunker to either one or two parallel process lines using the grab cranes and into each combustion chamber, via dedicated feed chutes and airlocks.

3.4 Furnace Types

3.4.1 Introduction

A number of different types of furnace are available, employing different combustion technologies.

It is proposed that the combustion technology for the plant will be an air-cooled moving grate furnace. This is the leading technology in the UK and Europe for the combustion of rMSW. The moving grate will comprise inclined fixed and moving bars that move waste from the feed inlet to the residue discharge. The grate movement will turn and mix the waste along the surface of the grate, ensuring all waste will be exposed to the combustion process.

The Incinerator Sector Guidance Note (S5.01) and the European BAT Reference documents discuss a number of alternative technologies for the combustion of waste.

1) Moving Grate Furnaces: as stated in the Sector Guidance Note, these are designed to handle large volumes of waste.

2) Fixed Hearth: not considered suitable for large volumes of waste. They are best suited to low volumes of consistent waste.

3) Pulsed Hearth: has been used for municipal waste in the past, as well as other solid wastes. However, there have been difficulties in achieving reliable and effective burnout of waste and it is considered that the burnout criteria required by IED would be difficult to achieve.

4) Rotary Kiln: have achieved good results with clinical waste but have not been used in the UK for MSW. The energy conversion efficiency of a rotary kiln is lower than that of a moving grate due to the large areas of refractory lined combustion chamber.

An oscillating kiln is used for municipal waste at one site in England and a number of sites in France. The energy conversion efficiency is lower than that of a moving grate for the same reasons as for a rotary kiln. In addition, the capacity per unit is limited to 8tph and for this application would need up to five number furnaces to achieve the design throughput, which is not economically feasible.

5) Pyrolysis/Gasification: various suppliers are developing pyrolysis and gasification systems for the disposal of municipal waste. However, it is not considered that any of these technologies can be considered to be proven. Pyrolysis and gasification systems which generate a syngas can theoretically take advantage of gas engines or gas turbines, which

are more efficient that a standard steam turbine cycle. However, losses associated with making syngas and the additional electricity consumption of the site due to the waste pre-treatment requirements means that the overall efficiency is no higher than for combustion plant and is generally lower. This means that a combustion plant will generally have a more beneficial effect on climate change.

Plasma gasification can theoretically produce a much more useful syngas than thermal gasification, but has a much higher electrical parasitic load and is in the early stages of commercial development for municipal waste treatment. It has been used successfully for treatment of hazardous wastes (the European BAT reference document for waste incineration refers entirely to plasma gasification for destruction of gaseous CFCs and other ozone depleting substances). However, there are no reference plants recovering energy from municipal waste in Europe. The only large scale commercial plant constructed in Europe closed in 2004. A few plants worldwide operate using MSW but the largest plant only has capacity to treat a fraction of the 300,000 tonnes per annum required waste throughput. Therefore, pyrolysis and gasification are not considered to be suitable alternatives to the current facility design.

6) <u>Fluidised Bed:</u> designed for the combustion of relatively homogeneous waste. For residual MSW, the waste would need to be pre-treated before feeding to the fluidised bed, which would lead to additional energy consumption and a larger building. The pre-treatment can also lead to higher quantities of rejected material. Where MSW is treated at a material recycling facility, the residues from the MRF may already be suitable for feeding to the fluidised bed. This does not apply to residues from kerbside collection schemes, which would need some pre-treatment, including shredding and metals removal as a minimum, before feeding to the fluidised bed.

While fluidised bed combustion can lead to slightly lower NOx generation, the injection of ammonia or urea is still required to achieve the emission limits specified in WID. Experience in the UK of fluidised bed combustion of MSW has been limited. Two plants are operational, but both have had significant operational problems. One is operating well below its design capacity while the other is still being commissioned. Biffa do not consider that they can be considered a reliable technology at this stage.

In summary, moving grate technology is proposed for this plant as it is believed that it represents the best choice when balancing the factors of mechanical reliability, energy efficiency, environmental impact and costs.

3.4.2 Description of air-cooled, mass burn, grate combustor

The proposed furnace is a mass-burn, air-cooled grate combustor, comprising multiple lanes with multiple air supply zones. A description of the waste feed and grate combustor follows.

<u>Feed Hooper and Waste Charging</u>

Waste will be introduced into the furnace via the feed hopper system that ensures that the following main requirements are fulfilled:

- when starting up the combustion line by means of the start-up burners, waste must not be put onto the grate until the minimum combustion chamber temperature is reached;
- during combustion waste column in the feed chute must prevent unwanted air entering the combustion chamber;
- during shutdown of the combustion line, backflow of flue gas into the combustion chamber must be prevented, even if the waste level in the feed chute is low.

The feed hopper, consisting of hopper, hopper flap-gate, feed-chute and support frame, will be made of steel. The slope of the hopper walls and arrangement of the hopper flap-gate will be designed to prevent arch build-up, thereby ensure continuous delivery of waste to the incineration grate. The height of the feed-chute will allow a sufficient column of waste that seals the combustion chamber from the waste bunker during combustion. The feed chute will be designed to resist thermal stress that may occur during operation. Hydraulically operated hopper flap-gates will be installed in the bottom of the hopper, one for each grate lane. The hopper flap-gates will seal the combustion chamber from the bunker prior to waste charging and during system shutdown.

An interlock with the combustion chamber temperature will ensure that during system start-up the hopper flap-valve cannot be opened for waste charging until the minimum combustion temperature in the combustion chamber is reached.

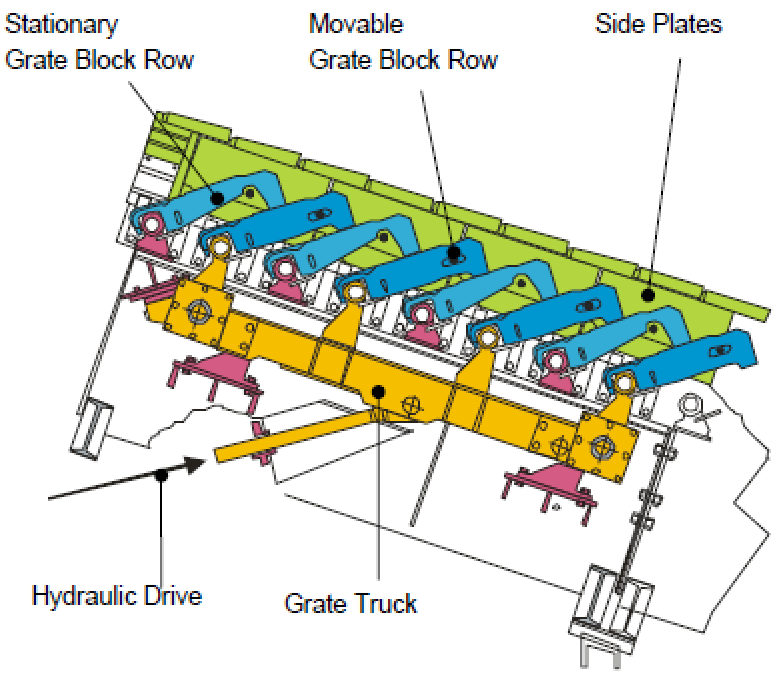
Feed-chute parts exposed to extreme thermal loads will be equipped with a cooling water jacket or other suitable protection. A feed system will be provided to fill the water system and compensate for any water losses.

From the feed-chute waste will fall on the horizontal feeder table over which hydraulically driven ram feeders (one for each grate lane) slide.

Combustion Grate

The combustion grate will consist of multiple lanes with multiple air zones (Figure 1). The number of grate elements and therefore grate size will be determined by waste throughput and design waste CV.

Figure 1:
Typical Cross-section of a Grate Element



3.5 Furnace Requirements

Efficient operation of the furnace requires control of combustion air, both primary and secondary combustion air, fed to the combustion grate.

3.5.1 Primary Air

Primary air will be drawn in from the waste bunker and delivered by the primary air fan to the underside of individual grate zones. Air flow rate will be controlled by a variable speed fan and a frequency converter. The speed control system will provide a coarse preliminary setting for the primary air flow rate allowing downstream control dampers in the delivery ducts to operate in their optimum range. In case waste CV is too low the air will be pre-heated, which ensures that the combustion products are properly burned out using no or as little auxiliary fuel as possible.

A steam-heated air pre-heater will be installed on the pressure side of the primary air fan.

3.5.2 Secondary Air

Some volatile waste components do not combust directly on the grate but instead will be released on exposure to heat and burnt as they pass through the secondary combustion chamber. Secondary air supplied will be part of the total air flow required for complete combustion. Injection of secondary air causes a swirl flow in the combustion chamber, which affects a good combustion, gas mixing and a uniform flow distribution in the direction of the main flow. The system comprises air ducts from the intake to the secondary air nozzles in the combustion chamber. Secondary air will be drawn from the top of the boiler house and delivered into the combustion chamber. Locally adjustable dampers will be installed in the distribution lines to the secondary air nozzles, so that correct secondary air distribution can be pre-set during initial setup. Secondary air flow rate will be regulated using a frequency converter controlled fan dedicated to supply secondary air or combined with the primary air fan. The combustion control system will set secondary air flow to provide a constant total combustion air flow rate.

Secondary air will be heated to increase efficiency of the boiler. A steam-heated, air pre-heater will be installed on the pressure side of the secondary air fan.

3.5.3 Start-up / Auxiliary Burner

The auxiliary burner(s) will serve a number of different roles, acting as start-up burner, burner for back-up firing and as a shutdown burner:

- at start-up it heats the combustion chamber to the specified minimum temperature before waste charging begins;
- backup firing is initiated if the temperature of the flue gases drops below the specified minimum temperature during waste-burning operation; and
- when the system is shut down, the burner maintains the minimum temperature in the combustion chamber until all waste on the grate has been incinerated.

The auxiliary burner(s) will be designed especially for use in waste incinerators. The burner will be located in the upper part of the combustion chamber. The control system, which ensures that the burner systems operate safely and as specified, provides the correct fuel/air ratio.

Summary of Compliance with Indicative BAT on Furnace Requirements:

- The furnace is designed such that the gases resulting from the combustion of non-hazardous wastes can be maintained at 850°C for at least 2 seconds;
- Auxiliary burner(s) will be provided to achieve and maintain the required combustion temperatures;
- Residence time in the furnace will be long enough to ensure complete burnout;
- Primary air will be controlled to minimise NOx production and minimise velocities and the entrainment of particulate; and

- An automated system will be used to trigger the supplementary burner(s) and to prevent additional waste feed until the required temperature is re-established.

3.6 Validation of Combustion Conditions

The plant will be designed to provide a minimum exhaust gas residence time after the last injection of combustion air of at least two seconds at a temperature of at least 850°C. This criterion will be demonstrated using Computational Fluid Dynamic (CFD) modelling during the design stage. Gas temperatures measured at various points within the boiler during commissioning will be used to confirm the minimum two seconds gas residence time at minimum 850°C requirement.

It will also be demonstrated once the Plant is fully commissioned that it can achieve complete combustion by measuring concentrations of carbon monoxide, volatile organic compounds and dioxins in the flue gases and LOI of the bottom ash. Location of the temperature probes will be selected using the results of the CFD model. Temperatures will be measured at the top of the first boiler pass and a temperature gradient set, based on measurements made at different levels during commissioning.

Combustion Control System (CCS)

The Combustion Control System (CCS) will allow largely automatic and secure operation at the requested load. Even with varying waste quality, compliance with operating conditions such as combustion chamber temperature, flue gas oxygen content, efficient gas and slag burn out, can be guaranteed by means of the control interventions. Using controlled steady combustion conditions will reduce excessive stressing of the combustion chamber.

Controls will maintain the constant steam flow preset by the operator; independent of waste calorific value. Controls also keep combustion temperature within permissible limits; to ensure efficient gas burn-out by keeping O_2 content within permissible limits and ensure necessary fire-end position for efficient slag burn-out.

The CCS will be a multivariable control system, with the controller structure consisting of both parallel and serial connections of different controllers, as realized in the Distributed Control System (DCS).

Summary of Compliance with Indicative BAT on Validation of Combustion Conditions:

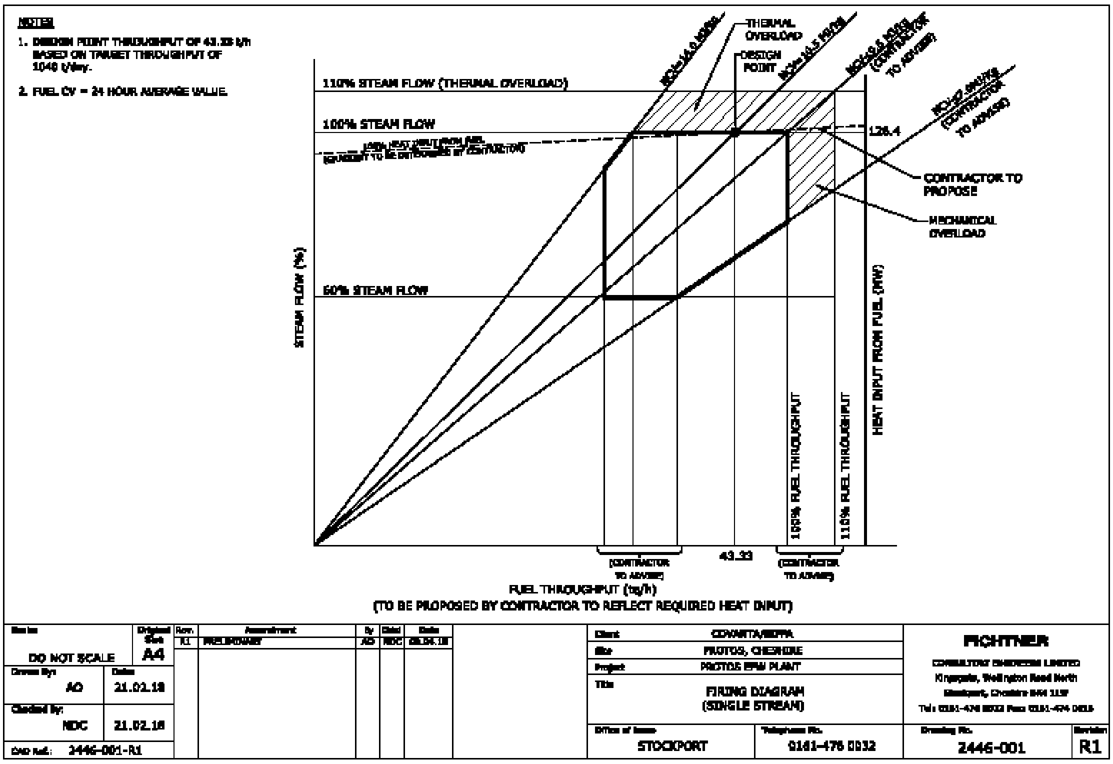
- At the design stage the use of a representative Computerised Fluid Dynamics (CFD) model where practical to demonstrate that the residence time and temperature requirements will be met and to identify the ideal (or best practicable) locations for temperature monitoring for the purposes of validation measurements; and
- At the operational stage validation techniques will be used in agreement with the Environment Agency;

3.7 Combined Incineration of Different Waste Types

The plant will be designed to accept a combination of rMSW, C&I wastes and up to 10% RDF. The firing diagram for a single incinerator line shown below (Figure 2) reflects this fuel mix.

Combustion control will be fully automatic, with the operator selecting the desired steam output. Large variations of the calorific value (CV) may require an adaptation of the parameters of the different control loops. Adaptation of all control parameters will be executed manually.

Figure 2:
Firing Diagram (single line)



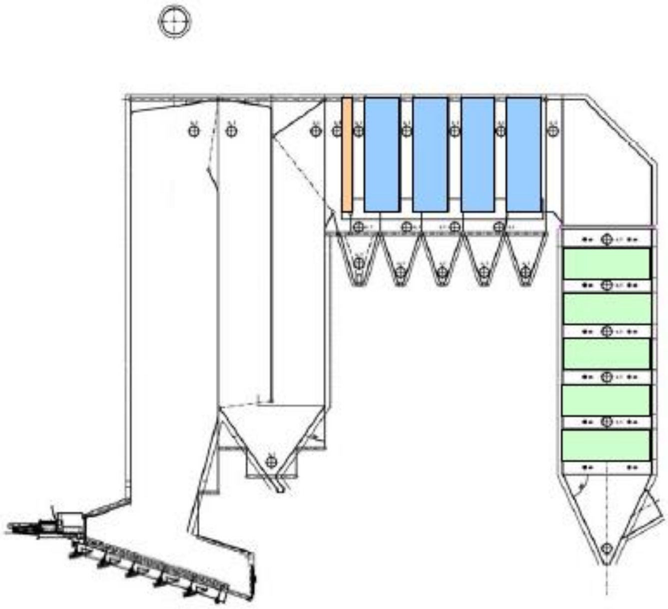
3.8 Boiler Design

The design of boiler selected for heat recovery from flue gases and production of superheated steam will be a multiple-pass steam boiler.

A typical steam boiler configuration is defined as follows (Figure 3) (the actual configuration will be contractor specific):

- first pass: vertical radiation pass made of membrane walls of evaporator;
- second pass: vertical radiation pass made of membrane walls of evaporator;
- third pass: vertical radiation pass made of membrane walls of evaporator with evaporator surface, as necessary;
- fourth pass: horizontal convection pass made of membrane walls with bundles of evaporator and super-heater heat exchange surfaces;
- fifth pass: vertical convection pass with bundles of economiser heat exchange surfaces: the pass is not made of membrane walls.

Figure 3:
Typical Five-Pass Steam Boiler Configuration



The steam drum will be placed above the vertical passes. The radiant boiler section located above the incinerator grate will consist of membrane walls. The sidewalls will extend downward and form an integrated part of furnace, providing cooling of the incinerator. In addition the front and back walls of the first pass will extend downwards to create the sloped roofs of the incinerator. Thermal expansion of the boiler will be compensated by expansion joints as necessary. The horizontal fourth pass will consist of membrane walls and convection tube banks.

Walls of passes 1-4 will be membrane walls i.e. consist of tubes connected by short metal plates and form the main part of the evaporator system, which will supply saturated steam to the steam drum. Saturated steam leaving the steam drum will be superheated in super-heaters. Spring-loaded safety valves will be provided to protect the heating surfaces from excessive pressure.

Boiler blow down system

The boiler will be equipped with a continuous blow down system from the boiler drum. Continuous blow down will be used to limit the amount of dissolved salts in the boiler water.

On-line cleaning of heat exchanger surfaces

A water shower cleaning system will be installed for on-line cleaning of the 1st and 2nd pass and the 3rd pass if convection sections are not included. It will enable an automatic cleaning of the membrane walls by means of injected water mainly due to the sudden evaporation of the water on the dust layers.

Heat exchanger bundles in the horizontal pass of the boiler will be cleaned on-line by rapping devices. Hammers will impact on the bottom headers of the bundles and the impact transferred to the collector by a pusher and from there to the tubes. By this means the convective tubes will be excited in harmonic frequencies.

Tube banks in the fifth pass, if vertical, will be cleaned with soot-blowers operated with steam. Discharged ash from the tubes falls down into the hoppers and will be removed by the FA handling system.

Refractory lining of furnace and first pass

The refractory system will be optimized for:

- proper ignition of waste;
- improved burnout of waste on the grate;
- protection of heating surfaces from high flue gas temperatures;
- achievement of high residence times for flue gases at high temperatures to ensure complete burnout;
- high heat transfer in the refractory material in order to - achieve low surface temperatures;
- cool down the flue gas within the limited height of the first pass; and
- avoidance of steps between the different zones of refractory lining in order to avoid deposits.

Requirements will be satisfied by choosing appropriate materials (including the use of Inconel in lieu of refractory in certain areas) and refractory thicknesses in different zones in the furnace.

Chemical Dosing

Conditioning of boiler feed water will be needed to prevent corrosion and achieved by addition of chemicals. Reagent chemicals will be supplied in totes connected to their respective metering pumps. Feed rates will be adjusted manually in response to the operating instructions and results of boiler water analysis.

Summary of Compliance with Indicative BAT on Boiler Design

- Boiler design and operation will minimise dioxin production; and
- Slow rates of combustion gas cooling will be avoided to minimise the potential for de novo formation of dioxins and furans

3.9 Energy Recovery

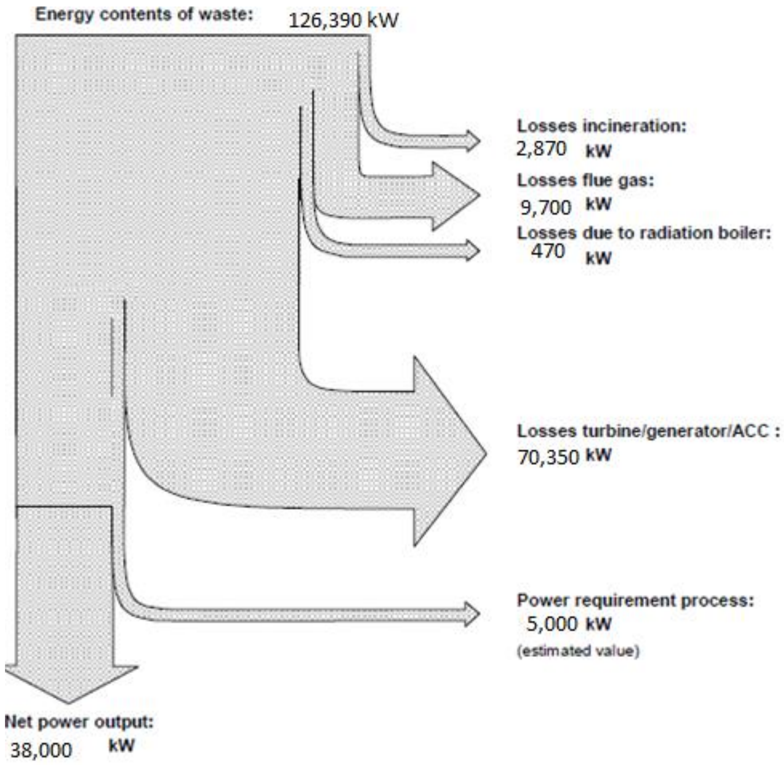
Energy recovery from the hot waste combustion gases will be achieved via the five stage boiler that includes a series of heat exchangers, super-heaters and economiser. Recovered heat from the combustion gases will be used to produce 120tph superheated steam at 422^0C and 62barg.

Steam will be supplied to a steam turbine turbo-generator set that generates 43MW, with 37MW available of electrical energy for supply to the national electrical grid. By means of steam extraction, low-pressure steam will be taken for internal uses within the plant.

After passing through the turbine the expanded steam is condensed in an air-cooled turbine condenser, with the condensate will be returned to the feed water tank.

Figure 4 presents a Sankey Diagram of expected energy values at nominal load.

Figure 4:
Sankey Diagram (350ktpa ERF facility)



3.10 Air Pollution Control System

The Air Pollution Control (APC) system will comprise three main elements;

- SNCR DeNOX system;
- acid gas neutralisation; and
- fabric filters.

SNCR DeNO$_X$

The DeNO$_x$-process will be based on the principle of non-catalytic reduction of NO_x in the gaseous phase with ammonia type reagents. The reduction will take place within a temperature range of 900-950°C, which exists in the furnace (first pass/boiler radiation zone).

In this area 25% aqueous ammonia (or urea) solution will be injected at several injection levels and elevations. The configuration of the nozzles will make it possible to achieve full-area coverage of the injection medium across the entire cross-section.

The narrow 900-950°C temperature window needed to successfully separate NO_x requires several injection points in the boiler radiation zone, as the temperature profile here is subject to fluctuation.

Temperatures higher than 1000°C trigger undesired secondary reactions and are responsible for higher ammonia consumption. At temperatures below 800°C efficiency of NO_x separation declines considerably and a large portion of the injected ammonia is routed to the flue gas treatment system without having been used.

Besides optimal adjustment of ammonia injection, steady operation of the incineration process will be crucial for optimum NO_x separation by means of the SNCR process. This will be ensured by the following measures:

- integrated combustion control system including an automatic adjustment to the desired NOx set point;
- consistent oxygen and temperature profiles in the secondary combustion chamber by means of the secondary air injection; and
- subsequent radiation pass without any internals, thus ensuring a prolonged reaction zone for the NOx-reduction.

Acid gas neutralisation

Flue gas treatment will be a dry system, achieved without use of water. Treatment will be based on injection of lime and activated carbon into the untreated flue gas. The system will be designed for continuous operation within the combustion diagram, up to pollutant concentrations referenced in WID.

Activated carbon will be injected to precipitate heavy metals, dioxins and furans by adsorption on its surface.

The APC reactor will ensure intensive contact between pollutants and fresh and recirculated lime, providing optimal conditions for neutralisation. Recirculation increases residence time and leads to improved utilisation of the sorbent and lower stoichiometric values compared with the “no recycle” process. At the same time heavy metals as well as dioxins and furans will be adsorbed by the powder activated carbon (PAC).

An Acid Gas Abatement Review is included as Appendix BATOT11.

Fabric Filters

The purpose of the fabric filters is to allow:

- precipitation of dust, neutralisation residues and contaminated activated carbon;
- absorption of heavy metals, unburned organics, dioxins and furans because of reactive carbon on the filter surface;
- absorption of acids (HCI, SO2, HF) by increasing the contact time between pollutants and sorbent; and
- recirculation of dry residues for better utilisation of absorbents.

The fabric filter will consist of multiple chambers with pressure impulse cleaning units. Each chamber can be isolated from the flue gas flow using pneumatic powered dampers. Chamber design will ensure homogenous dispersion of gas and dust within each of the chambers and on the filter surface.

The filter bags will be installed vertically with stabilising cages that stretch the fabric cloth. The surface of the cage will be smooth to prevent damaging the filter surface while installing or during online cleaning processes.

Filter bags will be cleaned automatically, initiated by a critical pressure drop above the whole filter or a defined period of time.

Continuous Emissions Monitoring

The continuous emissions monitoring (CEM) equipment will include measurements at both the front-end combustion stage and the back end air pollution control (APC) stage. CEMs equipment will be interlinked with the incinerator Distributed Control System (DCS) for waste feeding and the combustion and the APC systems, to provide alarms for non-compliant conditions and to enable the operator to safely shut-down the plant.

The CEMs equipment will have 100% redundancy.

There will be no dump stack or bypass of the FGT system.

3.11 Cooling Systems

Please refer to Section 3.8, Boiler Design for details.

3.12 Solid Residue Management

Two solid residues are generated:

- Incinerator Bottom Ash (IBA): sent for recycling as secondary aggregate; and
- Air Pollution Control Residues. (APCr)

IBA will be transported by conveyors from the boiler hall to the bottom ash storage area. IBA from the grate chain slag expeller will be transported to a rough parts separator ("bottom ash scalper"), consisting of a grid where coarse materials of the bottom ash are separated and stored in a container. The other part of the bottom ash will be transported further on belt conveyors to the bottom ash storage area.

Thermally insulated/contact protected conveyors collect boiler FA from the boiler passes. Boiler fly ash will be combined with bottom ash. Drawing in of ambient air into the boiler and bypassing flue gases will be prevented by double flap valves.

Residues from the APC system will be collected and conveyed to storage silo(s).

3.13 Process Control Systems

The EMCR (Electrical Measurement Control & Regulation) Concept contains relevant information for supply of process technology and the electrical portion of the plant. All electrical, instrumentation and control equipment will comply with current standards.

The distributed control system (DCS) will consist of four levels:

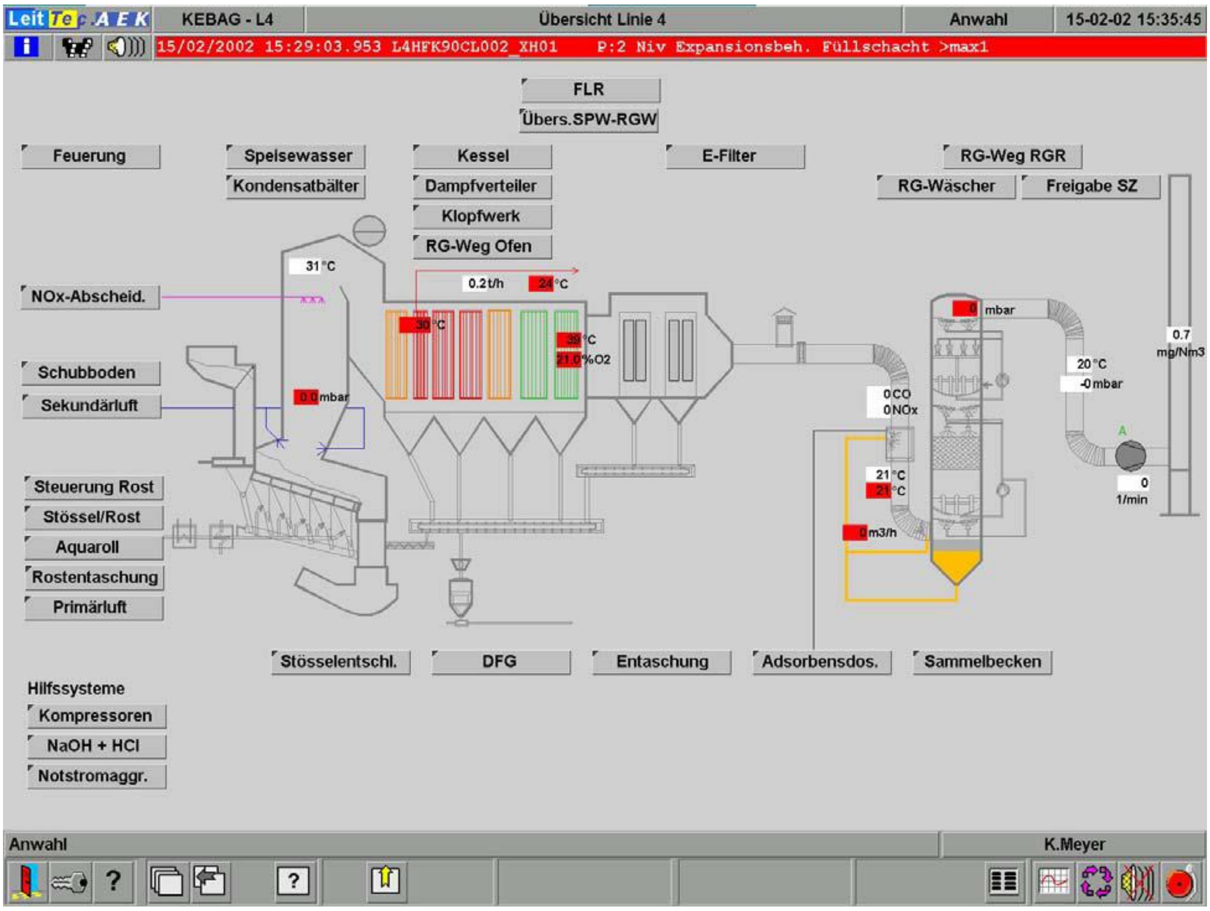
- field level: process equipment, probes, actuators and analysis devices;
- automation level: process control, automated devices and autonomous systems, safety;
- process control level: monitoring and controlling of process, data acquisition, programming tools; and
- plant control level: management, maintenance and supervision at plant level for technical and financial matters.

The DCS will be used to operate the plant and ensure safety of personnel and equipment. Data backup and restoring the DCS will be done on the servers. All relevant data will be archived and later restored.

The level of process control will include the real time Human Machine Interface (HMI) for operation, monitoring and visualization of the process in all sections of the plant e.g. waste treatment, incineration, flue gas treatment and common plant equipment. These functions are generally known as HMI. HMI provides the user with all facilities and functions needed for monitoring and control of the process.

A schematic for a typical HMI is shown in Figure 5.

Figure 5:
Typical HMI Schematic



4.0 EMISSIONS AND MONITORING

The following parameters will be monitored and recorded for the purpose of reviewing the incineration plant performance:

- total MSW throughput per annum (tonnes);
- total annual throughput of C&I wastes similar to MSW (tonnes);
- electricity generated (kWh)
- plant electricity used (kWh);
- electrical energy imported to the site (as kWh/tonne waste);
- light oil consumption (kg/tonne waste);
- mass of bottom ash (kg/tonne waste);
- mass of Air Pollution Control Residues (APCRs) (kg/tonne waste);
- mass of activated carbon (kg/tonne waste);
- mass of quick or hydrated lime (kg/tonne waste);
- mass of ammonia hydroxide or urea solution (kg/tonne waste);
- water consumption (m3/tonne waste);
- low grade heat utilised / recovered (once the heat plan is implemented); and
- emissions to air, by continuous and discontinuous monitoring.

4.1 Point Source Emissions to Air

The combustion process will result in the following substances being released from the exhaust stack:

- carbon dioxide;
- water vapour;
- particulate matter;
- acid gases including sulphur dioxide, nitrogen oxides, hydrogen chloride and hydrogen fluoride;
- heavy metals;
- carbon monoxide;
- volatile organic compounds (VOC's); and
- dioxins and furans.

The exhaust stack is proposed to be 90m high with either one or two flues housed within a single stack. Determination of stack height and prediction of emissions from the stack has been undertaken as part of the updated Air Quality Atmospheric Dispersion Modelling Assessment and is presented as Appendix BATOT7 to this document.

The incineration plant will be designed to comply with the emission limit values for releases to air (under normal operating conditions), specified within the IED, Annex 6, Part 3 "Air Emission Limit Values for Waste Incineration Plants". The proposed air pollution control equipment incorporated in the facility will allow the plant to operate at emissions levels in compliance with IED.

Table 4:
Point Source Emissions to Air

Emission Point	Release Point	Stack Height	Stack Diameter	Flue Gas Velocity	Actual Flow Rate
A1 or A1 and A2	Stack	90m	2.7 m	21.8 m/s	125 Am^3/s

The proposed air pollution control system is a combination of the five following processes;

- SNCR process for Non Catalytic Reduction of NO_x by injection of ammonia or urea solution to convert oxides of nitrogen to nitrogen and water;
- neutralization of acid gases by injection of lime in a dry process;
- dioxin reduction by injection of activated carbon; and
- dust removal using a fabric bag filter.

The flue gas treatment for acid gases is achieved using a dry recirculation process APC system based on quick or hydrated lime. As detailed above, the dry abatement process using either quick or hydrated lime or sodium bicarbonate can be considered to be BAT for Newhurst ERF in that both achieve a high degree of performance.

VOC emissions will be minimised through careful control of the storage conditions recommended by the manufacturer of all chemicals and oils. All chemical storage containers will have routine integrity inspections by competent persons.

Operational measures to control the release of Oxides of Nitrogen, acid gases and Halogens, Carbon Monoxide and VOCs and Dioxins and Furans are detailed further below.

4.1.1 Monitoring and Reporting Emissions to Air

Emissions would be from a single stack containing one flue for each furnace/boiler line. The optimal stack height of 90m for prevention of significant contaminant concentrations at nearby receptors has been determined through detailed dispersion modelling. The full air dispersion report is included within Appendix BATOT7.

The incineration grate will be designed and operated to ensure effective combustion is achieved, maintaining CO and VOC levels below the required limits without need for further abatement. Continuous emissions monitoring of flue gas will identify any potential emissions issues and lead to initiation of appropriate mitigation measures.

Emission limit values will not exceed the benchmark values associated with BAT, as stated in the incineration sector guidance note.

The proposed monitoring regime, including monitoring frequency and emission limit values for point source emissions to air, is detailed in the Air Quality Atmospheric Dispersion Modelling Assessment submitted with this Environmental Permit variation application.

IED monitoring requirements are outlined in Table 5 below.

Table 5:
Summary of Monitoring of Emissions to Air from Stack

Parameter	Emission Point	Emission Limit (mg/Nm3)[(A)]	Reference Period	Monitoring Frequency
Total Dust	A1 or A1 and A2	10	Daily Average	Continuous Measurement
Total Organic	A1 or A1	10	Daily Average	Continuous

Parameter	Emission Point	Emission Limit (mg/Nm3)(A)	Reference Period	Monitoring Frequency
Carbon (TOC)	and A2			Measurement
Hydrogen Chloride (HCl)	A1 or A1 and A2	10	Daily Average	Continuous Measurement
Hydrogen Fluoride (HF)	A1 or A1 and A2	10	Periodic over minimum 1-hour period	Quarterly in first year, then bi-annual
Sulphur Dioxide SO2)	A1 or A1 and A2	50	Daily Average	Continuous Measurement
Oxides of Nitrogen (NO and NO2 expressed as NO2)	A1 or A1 and A2	200	Daily Average	Continuous Measurement
Carbon Monoxide (CO)	A1 or A1 and A2	50	Daily Average	Continuous Measurement
Group 1 Metals – Cadmium and Thallium and their compounds	A1 or A1 and A2	0.05	Periodic over minimum 30-minute, maximum 8-hour period	Quarterly in first year, then bi-annual
Group 2 Metals – Mercury and its compounds	A1 or A1 and A2	0.05	Periodic over minimum 30-minute, maximum 8-hour period	Quarterly in first year, then bi-annual
Group 3 Metals – Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	A1 or A1 and A2	0.5	Periodic over minimum 30-minute, maximum 8-hour period	Quarterly in first year, then bi-annual
Dioxins / furans (I-TEQ)	A1 or A1 and A2	0.0000001	Periodic over minimum 6-hours, maximum 8-hour period	Quarterly in first year, then bi-annual
Ammonia	A1 or A1 and A2	10	½ hour and/or Daily Average	Continuous Measurement

Notes:
(A) Concentrations referenced to temperature 273 K, pressure 101.3 kPa, 11% oxygen, dry gas.

The monitoring regime will enable Biffa to assess performance of the abatement system and facilitate early identification of any potential environmental impacts.

Following guidance received from the relevant authority and the Council, it is considered that the proposed ERF facility at Newhurst will constitute a “plan or project” as defined by the Conservation (Natural Habitats Regulations 1994). Under Regulation 48 of the Habitat Regulations, the competent authority will be required to make an appropriate assessment of the implications for the site in view of that site’s objectives.

The Air Quality Atmospheric Dispersion Modelling Report has considered all biological receptors, including sites protected under the Habitat Regulations, within a 10km radius of the site. An initial ecological assessment has been undertaken as part of the planning application and a copy included as Appendix 8 of this report.

For further details of possible impacts of the development on potentially sensitive receptors refer to the Human Health Review, Environmental Risk Assessment and Air Quality Atmospheric Dispersion Modelling Report submitted as part of this EP application.

4.1.2 Sampling Techniques/Calibration

Continuous Emissions Monitoring (CEM) procedures will be in line with all recognised standard reference methods as detailed in the EA's Technical Guidance Note (Monitoring) M2.

CEMs will be designed to measure concentrations of regulated flue gas parameters emitted from the stack as specified in the monitoring regime. All CEMs equipment will be calibrated to the required standard reference methods. All CEMs analysers will be subject to quality assurance procedures defined in EN 14181 (QAL1, QAL2, QAL3 and AST). Calibration will be undertaken according to the QAL2 procedure of EN 14181 and compliance with the variability test will be undertaken. Organisations that carry out stack flue gas measurements required by the permit will be accredited to BS EN ISO 17025 and MCERTS.

All monitoring at the facility will be in accordance with the conditions of the Environmental Permit, published legislative guidance and Biffa's monitoring procedures as detailed in Biffa's EMS. Point source emissions to air will be monitored in accordance with the Environmental Permit, including during commissioning, start up and shut down.

4.2 Process Monitoring

The Distributed Control System (DCS) will enable monitoring of process variables that could have an effect on performance of the facility and / or emissions to the environment. The DCS will monitor the following key parameters, in addition to normal operating conditions such as temperature, pressure etc.:

- prevention of waste being charged to combustion grate;
    - at start-up: until 850°C as measured near the inner wall has been reached;
    - whenever temperature in the secondary combustion chamber reduces to 850°C; and
    - whenever CEMS measurements required by IED show exceedances of ELVs due to disturbances or failure of the purification devices.
- combustion capacity i.e. keeping plant within its permissible thermal capacity. The furnace is designed for continuous waste combustion in the range 60-110% of thermal design load. In case of very low power and heat requirements, sub-load operation at 60% of thermal load can be conducted. The area of operation is shown in the Combustion Diagram;
- SCC temperature - in the event the SCC temperature on a one hour average drops below the permitted 850^0C limit, oil-fired auxiliary burners automatically start operation. Experience shows that such activation occurs very rarely. Predominantly burners remain in a stand-by position and are cooled by fans provided. The burners are routinely used for start-up and shut down of the Plant. The set point at which this occurs is pre-set;
- trend in acid gas concentrations and accordingly adjustment of dosing rate of the reagent injection system, specifically with regards to HCl;
- SNCR dosing - optimised to prevent ammonia slip; and
- differential pressure across bag filters increases outside set limits.

In accordance with the requirements of IED the following parameters will be monitored:

- electricity – metered import and export;
- temperature;
- oxygen concentration;
- differential pressure across the bag filters; and

- reagent feed rates.

Summary of Compliance with Indicative BAT on Emissions to Air

- the plant will be operated in order to comply with the emission limit requirements of WID;
- fabric filters will be used which will help to provide reliable abatement of particulate matter;
- fabric filters with multiple compartments will be used which can be individually isolated in case of individual bag failures;
- differential pressure will be measured across the bag filters to indicate when cleaning or maintenance of the filters is required;
- the system that is proposed will allow the various primary air flow rates required for optimum combustion to be provided for each individual grate zone;
- SNCR using ammonia or urea solution will be provided;
- a NOx Abatement Assessment has been provided in Appendix BATOT12 to this document which considers primary NOx abatement only, SNCR and SCR using the methodology outlined in the EA's Environmental Risk Assessment;
- waste acceptance procedures and procedures for dealing with non-conforming waste will help to prevent the release of acid gases by allowing the removal of problem wastes and homogenising the waste feed for optimum combustion;
- the plant will be designed to accommodate the range of wastes that may be accepted at the facility;
- alkaline reagent dosing system will be optimised;
- an Acid Gas Abatement Assessment has been provided in Appendix BATOT11 to this document which considers primary acid gas measures, wet scrubbing system, semi-dry scrubbing system and dry scrubbing system using quick or hydrated lime or sodium bicarbonate using the methodology outlined in the EA's H1 Environmental Risk Assessment; and
- a Global Warming Potential Assessment has been provided in Appendix BATOT4 to this document which considers choice of waste treatment technology, type of waste combustion process; and operational efficiency of the process using the methodology outlined in the EA's H1 Environmental Risk Assessment.

As detailed above, the dry abatement process using either quick or hydrated lime or sodium bicarbonate can be considered to be BAT for Newhurst ERF in that both achieve a high degree of performance.

4.3 Point Source Emissions to Groundwater

There will be no point source emissions to groundwater from the ERF facility.

4.3.1 Monitoring of Groundwater

There will be no direct discharge to groundwater.

4.4 Point Source Emissions to Surface Water

Surface water runoff would be managed in accordance with the principles of SUDS so that the rate of runoff would be no greater than the existing (pre-development) situation. Clean surface water (rainwater) from roofs may be captured and used for irrigation. Water from roadways would be passed via silt and oil interceptors to a surface water attenuation pond, prior to discharge from the application site (with Consent from the EA).

A peripheral drain system in combination with a catchment drain would provide drainage of surface water from the site. An open water-balancing pond would also be constructed to the south-eastern part of the site, at the lowest point of the site, before feeding into the existing pond in the woodland to the east. This would be capable of holding 2,500m^3 of excess surface water from the site.

In summary, the surface water management scheme is as follows:

- surface water management would seek to control the drainage from the development using sustainable drainage techniques (SUDS);
- it is proposed that where possible rainfall runoff will be harvested for use as irrigation;
- however, where harvesting is not proposed runoff from areas of roof will be discharged with attenuation off site;
- surface waters will be discharged to the Shortcliff Brook;
- it is proposed that runoff from areas of external kerbed hard standing will be passed through a hydrocarbon and silt interceptor prior to being discharged off site via the Shortcliff Brook with attenuation;
- it is proposed that drainage from all waste handling areas would be positively drained to a foul sewer and / or sealed tanks which would be subject to routine inspection and emptied as required prior to disposal off site; and
- any drainage from the waste bunker would be separately collected for treatment and/or disposal off site.

Discharge from the lagoons will be to the adjacent Brook and will be regulated by the EA.

A copy of the updated Flood Risk Assessment (FRA) (produced for the planning application submitted and approved in 2014) is included as Appendix BATOT3. The FRA demonstrates that flood risk issues at this site are manageable and that future site occupants can be safeguarded for the lifetime of the development. The site is duly presented as being sustainable in terms of flood risk, subject to proposed mitigation measures being implemented.

4.4.1 Monitoring and Reporting Emissions to Surface Water

An EA Permit condition will regulate the discharge of surface water from the site and will be agreed prior to commencement of operations. It is anticipated that the relevant consent will impose limits on suspended solids, oil and grease.

No breach of standards likely to occur from plant releases, as illustrated in the H1 Part 2 assessment (reference 413.00034.00562/H1P2), resubmitted with this variation application.

4.5 Point Source Emissions to Sewer

There will be a foul water connection to the sewer servicing welfare facilities. There will be no routine process water discharge from the installation under normal operating conditions. There may however be a discontinuous discharge of process water during upset conditions or from routine maintenance of the plant – the boiler for example.

The plant is a net user of water and only during upset conditions or certain maintenance will there be a need to discharge effluent to sewer or tanker it away.

The exact nature of the discharge will be determined following commissioning and a Trade Effluent Discharge Consent will be sought with the relevant sewage undertaker. Until such time a discharge consent is in place, any process water for discharge will be removed from the site via tanker to a suitably licensed facility.

4.5.1 Monitoring and Reporting Emissions to Sewer

In the event that emissions to sewer are required, the proposed monitoring regime, including the monitoring frequency and emission limit values will be agreed with the sewage undertaker / relevant authority in the terms of the Trade Effluent Discharge Consent.

4.6 Point Source Emissions to Land

The proposed site is an ERF facility; there will be no point source emissions to land.

4.7 Odour

The plant has been designed in accordance with the requirements of the IED and will employ BAT for control of emissions.

Operations at the site will be undertaken in accordance with procedures that will ensure any problems associated with odours will be identified and appropriate remedial and corrective action will be implemented as soon as practicable.

Measures to minimise odorous emissions the site will include:

- use of rapid closing doors;
- all vehicles entering the facility will be covered / sheeted;
- waste will only be unloaded within the enclosed tipping hall into the waste bunker;
- air will be continually drawn from the reception hall for use in the combustion process;
- control of traffic from the central control room will serve to minimise the occurrences where the doors will be open during times of strong cross winds, and therefore the potential for odour emissions will be mitigated;
- site personnel operating the waste feed crane will be trained to ensure that optimum mixing of waste takes place;
- refuse bunker will be turned over periodically to prevent any build-up of putrescible wastes;
- there will be periodic olfactory monitoring at the site building entrance and the site perimeter to identify any sources of odour and to establish whether any odours are discernible at the perimeter of the installation;
- in the unlikely event that odour is detected at the installation boundary, additional monitoring will be undertaken at any potentially sensitive receptors;
- in the highly unlikely event that odour is found to be causing a problem at the site, action would be taken to determine the source and appropriate actions to prevent reoccurrence; and
- the facility will operate on a 24 hour basis to ensure maximum turnover of accepted waste.

All operational parts of the installation will be contained within enclosed buildings. The mixing of waste in the bunker will prevent the formation of anaerobic conditions in which bacteria can decompose the waste leading to odour issues. Bunker management procedures will be developed and employed to minimise this effect.

It is not envisaged that ash handling will cause significant odour issues as handling will take place inside the ERF building. In addition vehicles removing ash will be covered before leaving the site.

The incineration plant is designed to allow easy access for on-line servicing and maintenance, thereby minimising plant down time and opportunities for odour losses.

In the event of a plant shut-down for a prolonged period, no waste would be accepted at the installation for treatment, thereby minimising potential odour creation and build-up in the bunker.

Enclosure and treatment of extracted air within the furnace will be the primary means of minimising odour emissions. No further odour abatement is considered necessary at the installation.

Regular checks at the site boundary will ensure that significant odour is not generated. Where odour detection becomes significant appropriate preventative action would be taken.

Summary of Compliance with Indicative BAT on Odour

- confining waste to designated areas;
- regular cleaning of waste handling areas
- preventing anaerobic conditions by aeration, turning of waste and short timescales;
- feeding of as much odorous air as possible into the combustion process; and
- use of activated carbon in the flue gas treatment process.

4.8 Noise and Vibration

All waste treatment will take place within the main ERF building, which will be constructed from single skin, profiled steel with self-closing doors, ensuring the building will achieve a sound reduction of at least 20dB.

Biffa will employ good practice measures for control of noise. Maintenance plans will be included as part of Biffa's certified EMS that will ensure maintenance is undertaken in accordance with manufacturer's specifications.

A noise assessment has been reproduced n in accordance with BS4142, as part of the Planning Application submitted and approved in 2014. The updated noise assessment is included as Appendix BATOT9.

The assessment found that:

- predicted daytime and night-time noise rating levels produced by fixed plant at the proposed development would give a positive indication that complaints are unlikely at all of the nearest noise-sensitive receptors assessed
- on-site heavy goods vehicle movements would have no impact on the existing measured ambient noise levels at any of the nearest noise-sensitive receptors assessed; and
- cumulative impact of all operations would have no effect on the existing ambient noise levels at any of the nearest noise-sensitive receptors assessed.

The following noise mitigation measures would also be considered to reduce noise levels at the site as required:

- periods when access doors are open should be kept to a minimum or, preferably, avoided during the night-time period;
- increase the sound reduction performance of the building envelope by improving the specification of the walls;
- ensure the plant is maintained appropriately to ensure noise emissions are minimised;
- use quiet plant options wherever possible; and
- use localised screening and/or acoustic enclosures where possible.

The risk of noise has also been assessed as part of the Environmental Risk Assessment (SLR Ref: 413.00034.00562/ERA), in accordance with the EA template. The overall risk from the proposed activities from noise was assessed as not significant given the proposed mitigation measures and location of the site.

4.9 Fugitive or Diffuse Emissions to Air

In the context of the Environmental Permit fugitive emissions relate to particulate matter, dust, volatile organic compounds (VOCs), litter and fugitive releases to surface water and groundwater. Odour and noise are discussed in separate sections within this document (Sections 4.7 and 4.8 above).

4.9.1 Particulate Matter

A bag filter system is used for separation of particle pollutants from the flue gas. These pollutants mainly consist of entrained dust, unused absorbent and used absorbent (see Section 3.0 for process details).

Fabric bag filters for the abatement of particulates are accepted as BAT. Bag filters contain multiple compartments each containing a specific number of filter bags and allow the isolation of particular compartments for repair or refit bags in the case of failure, while allowing these operations to continue without risk of emissions. See Sections 1.4 and 3.0 of this document for further details.

4.9.2 Dust

All vehicles entering and leaving the installation will be enclosed, thereby minimising potential dust emissions during transport. Good housekeeping procedures will ensure that any spillages of material are rapidly removed to enclosed areas / containers, and regular sweeping / cleaning of roadways will minimise the build-up of and subsequent transport of dusts around the installation and off-site.

Refuse vehicle unloading will take place within the enclosed tipping hall, which will be fitted with self-closing doors. To minimise escape of dust from the tipping hall combustion air will be drawn through it.

Reagents will be delivered in sealed road vehicles. They will be connected to the bulk storage silos by flexible hoses and discharged using the on-board vehicle air compressors. Silos will be fitted with level sensors and alarms to prevent overfilling and top filters to minimise dust emissions in any displaced air. Delivery of reagents to the process will be via fully enclosed mechanical extraction devices and speed-controlled feed screws.

All vehicles carrying ash will be sheeted before leaving the building to minimise fugitive losses of dust; also ash will be damp.

Flue gas treatment residues will be removed from bag filters and stored in dedicated silos prior to off-site removal in fully enclosed tankers.

Ash Management

The main potential for generation of dust from the facility will be the production, handling and transport of ash. See Sections 1.4 and 3.0 of this document for further details. The nuisance associated with ash management is considered to be negligible due to the proposed operational procedures and management techniques.

Flue Gas Treatment Chemicals

See Sections 1.4 and 3.0 of this document for further details. The nuisance associated with ash management is considered to be negligible due to the proposed operational procedures and management techniques.

4.9.3 Volatile Organic Compounds (VOCs)

All substances e.g. fuels or oils used on site will be stored in vessels according to manufacturer's recommendations. The following mitigation measures will be employed where appropriate;

- storage vessels will be enclosed and will be fitted with appropriate venting devices;
- breathing losses minimised through fitting of pressure / vacuum valves;
- sealed transfer system where possible; and
- temperature control system to be employed to ensure correct storage temperature is maintained.

Storage containers will be subject to routine inspections as detailed within Biffa's EMS.

Odour is discussed above in Section 4.7.

*4.9.4 Litte*r

The site will be designed and operated to reduce fugitive emissions to the surrounding area. Waste will arrive at the site in sheeted vehicles and stored and treated within the building. Monitoring procedures will be in place at the site to ensure any litter within the building does not escape the site on to neighbouring land.

4.10 Fugitive or Diffuse Emissions to Surface Water, Sewer and Groundwater

The site will be designed and operated to minimise fugitive emissions to surface water, sewer and groundwater. The site will accept only waste types detailed in the Environmental Permit (non hazardous and inert).

Storage of waste will occur only in the waste reception hall on an impermeable surface. The tipping floor is sloped to the waste bunker to contain any leakage or washdown.

Sub surface structures

Pipe work will be associated with water and effluent management. Wherever possible this will be located above-ground to enable easy access and maintenance. Any pipe work situated below ground will be constructed from materials resistant to the contents and designed to handle maximum volumes.

For subsurface structures, the following will be provided at the detailed design stage:-

- a record of the routing of all installation drains and subsurface pipe work;
- all sub-surface sumps and storage vessels will be identified;
- engineered systems to minimise leakages from pipes will be provided;
- secondary containment and/or leakage detection for sub-surface pipe work, sumps and storage vessels will be provided; and
- an inspection and maintenance programme for all subsurface structures, eg. Pressure tests, leak tests, material thickness checks or CCTV will be established.

A detailed surfacing and drainage plan will be provided to and agreed with the EA. The surfacing and drainage plan will ensure that the design of all operational areas will take into consideration collection capacities surface thicknesses, strength/reinforcement; falls, materials of construction, permeability and resistance to chemical attack.

Inspection and maintenance procedures will be provided for impervious surfaces and containment facilities.

Sumps

All sumps will be:

- be impermeable and resistant to stored materials;
- be subject to regular visual inspection and any contents pumped out or otherwise removed after checking for contamination;
- where not frequently inspected, be fitted with a high level probe and alarm, as appropriate; and

- be subject to programmed engineering inspection (normally visual but extending to water testing where structural integrity is in doubt).

Bunds

Bunds will:

- be impermeable and resistant to the stored materials;
- have no outlet (that is, no drains or taps) and drain to a blind collection point;
- have pipework routed within bunded areas with no penetration of contained surfaces;
- be designed to catch leaks from tanks or fittings;
- have a capacity greater than 110 percent of the largest tank or 25 percent of the total tankage, whichever is the larger;
- be subject to regular visual inspection and any contents pumped out or otherwise removed under manual control after checking for contamination;
- where not frequently inspected, be fitted with a high-level probe and an alarm, as appropriate;
- where possible, have tanker connection points within the bund, otherwise provide adequate containment; and
- be subject to programmed engineering inspection.

Storage

Materials will be stored indoors in designated, bunded areas to minimise environmental risks. These areas will be clearly marked and maximum storage capacities clearly stated. Any issues relating to compatibility and separation distances will be taken into account.

Regular checks and audits will ensure that storage areas are well maintained in accordance with best practice.

Access to storage areas will be designed to minimise risks of collisions and spillages. Where appropriate chemical spillage scenarios will be incorporated into the on-site emergency plan, which will be subject to periodic review.

Site Surfacing and Drainage

The site surfacing and drainage system will be designed to minimise potential losses of contaminants to surface and groundwater. Key areas in which hazardous materials will be handled will be provided with extra protection, such as kerbing and bunding, and all parts of the installation will be subject to regular visual inspection to maintain integrity.

Bulk liquid storage tanks, such as those containing fuel oil, will be in dedicated and isolated bunds (as detailed above). Drainage from bunded areas will be discharged in accordance with the permit and / or trade effluent discharge consent agreed with the sewage undertaker.

4.11 Pest Control

Risks associated with pests from the proposed activities have been assessed in the H1 Assessment. Taking account of the probability of exposure and the consequence the overall risk was deemed not to be significant. This is due to the strict operational procedures that will be employed at the site and the storage and handling of waste within the building. However, should pests become a nuisance at the site or the surrounding environment (and attributed to operations at the site) a pest control contractor will be brought in immediately to alleviate the problem.

4.12 Monitoring and Reporting of Emissions (to water, sewer and air)

Monitoring will be undertaken during all phases of operation as required by the conditions of the permit.

To Air

Monitoring and reporting of emissions to air will be undertaken per the requirements of IED and permit conditions. Monitoring will be undertaken during plant commissioning and during operation as per permit conditions. Need for scope and frequency of additional monitoring will be reviewed in light of data obtained during commissioning trials.

Monitoring will be undertaken using MCERT CEM equipment. Emissions data will be electronically stored in appropriate formats for the Environment Agency's review.

Continuous monitoring will be undertaken as required by WID. It is proposed to use HCl as a surrogate for HF, with periodic sampling and testing specifically for HF. The averaging periods and compliance criteria will be implemented as required by WID.

Gas flow measurement will be included and will be measured as per the conditions of the permit.

Periodic visual and olfactory assessment will be undertaken also.

Monitoring software will be capable of calculating half hourly, daily and other averages as appropriate.

To Water:

There will be no routine release of process effluent sewer. A small quantity of process effluent may on occasion need to be discharged to sewer under a Trade Effluent Discharge Consent or tankered off-site (as detailed above in Section 4.5).

Surface water will be discharged to controlled water after passing through an on-site interceptor and a lagoon system. Monitoring will be agreed with the EA and the water company prior to commencement of operations but is expected to typically include visual inspections for oil and grease and sampling for solids and pH. This will be confirmed during commissioning.

A table of emissions comparing expected concentrations with benchmarks is provided in H1-Part 2 Assessment. All emissions will be compliant with those stated in the IED.

5.0 INFORMATION

5.1 Records

Biffa will keep records of a number of performance indicators and environmental indicators (e.g. monitoring records). Records will be legible and easily retrievable on request (either in hard copy or electronically). Records will be kept in line with the conditions of the Environmental Permit issued for the site. For example, the following records will be kept:

- computerised weighing control system will be provided, recording vehicle weights and enabling issuing of waste transfer notes;
- detailed records will be maintained of all wastes produced at the installation, including amount produced, type, destination and treatment;
- records of all wastes sent off-site will be maintained, in line with Duty of Care requirements. Duty of care records will be kept for a minimum of 2 years;
- records of potentially polluting events will be kept at the facility during the life of the permit;
- waste inputs to the plant will be recorded en masse via the weighbridge. Throughput rates to the combustion grates will be measured and recorded using the load cells on the grab crane feed system, which enables operators to record the weight of each grab load before discharge into the feed chute. Gas temperatures will be continually monitored and recorded, and audible and visible alarms will be activated in the control room if the one hour average temperature falls below 850°C; and
- a record of the routing of all installation drains and subsurface pipe work will be generated at the detailed design stage as will a record of the build materials and areas at which potentially pollution substances are held. In addition, records of potentially polluting events will be kept at the facility during the life of the permit.

The above list is not exhaustive. Records will be kept to satisfy the requirements of the Environmental Permit and all other relevant statutory legislation.

Biffa will ensure that all documents are issued, revised and maintained in a consistent fashion and will adequately record all details necessary to satisfy the conditions of the Environmental Permit once issued. The procedure for managing documentation and records will be set out in Biffa's EMS.

5.1.1 Decommissioning

The installation will be constructed in a manner that enables decommissioning with minimal environmental impact. Wherever possible, tanks, bunds and pipe work will be above ground to facilitate easy access. Where this is not possible additional containment will be provided and regular monitoring and leak checks will ensure that potential environmental harm from fugitive emissions is minimised. All plant items and equipment will be subject to preventative maintenance.

Vessels and pipe work will be situated in areas that enable drain down of contents over areas of contained concrete hard standing, thereby minimising environmental impacts in the event of losses of containment.

The surface water lagoons will only receive clean rainwater run-off from site hard standing or the roof under normal operating conditions, and the discharge will pass through an oil-water interceptor prior to entering the lagoon as required. The interceptor will be routinely checked and emptied to maintain optimal performance. Consequently, contaminant concentrations in the lagoon sediments are expected to be negligible.

Building insulation materials will be selected that present the minimal environmental risk, both in terms of use during plant operations and decommissioning. Building construction materials will be selected to combine operational efficiency with future requirements and demands.

5.1.2 Closure Plan

Biffa will be the sole occupiers of the Newhurst ERF Facility and there are no other operators undertaking prescribed processes within the permit boundary

The site closure plan will be drafted upon completion of the detailed design and finalised and agreed with the EA prior to commencement of operations. The key aspects to be included in the plan are:

- maps and plans showing areas containing potentially polluting substances over the life of the plant;
- details of storage vessels and pipe work that will hold potentially polluting substances;
- records of building and plant materials and constructions;
- location of records of pollution incidents to ensure that contamination is addressed as part of decommissioning;
- location of the Environment Permit, including the Site Condition Report that provides the soil and groundwater baseline conditions;
- safe removal of chemicals and reagents from site;
- decontamination and deconstruction of site infrastructure;
- use of recyclable materials where possible; and
- methodology for decommissioning will minimise dust, odour; noise and other possible sources of nuisance.

Above all protection of human health, groundwater and the wider environment will be paramount when decommissioning the site.

5.2 Reporting/Notification

Reporting and Notification will be in line with the requirements of the Environmental Permit and all relevant legislation.

In line with the Environmental Permit for the site and good practice, the EA will be notified as soon as is practicable of the following:

- any malfunction, breakdown or failure of equipment that results in an abnormal emission;
- any techniques, accident, or fugitive emission which has caused, is causing or may cause significant pollution;
- the breach of a limit specified in the Environmental Permit; and
- any significant adverse environmental and health effects.

6.0 CLOSURE

This report has been prepared by SLR Consulting Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use Biffa Waste Services Limited; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.