The End Journey

Schedule 13 Small Waste Incineration Permit Application Supporting Documents

Date:

Contents

A Introduction

The End Journey Ltd proposes to install a new pyrolysis plant located on land at 544 Duncombe Road, Bradford, and known herein as the 'facility'.

The facility comprises of a pyrolysis plant which will use either refuse derived fuel (RDF) or rubber tyres as the feedstock for the process. The waste is non-hazardous. This report has been produced out based on information provided by The End Journey Limited who are the operator of the facility.

The pyrolysis process uses heat to decompose the feedstock (waste) material. The heat is provided by gas burners which use gas collected on each previous process to fuel the burners and provide the heat for the pyrolysis to occur. As the plant is using combustion gases produced by the feedstock waste, the plant is considered an incineration facility.

The facility will use two gas burners to provide heat to the pyrolysis reactor. Each of these burners has a thermal output of 360 kW (a net thermal input of ~360 kW). As such the gas burners are not medium combustion plant (i.e. below 1 MW net thermal input).

The process is non-continuous operation and instead is a batch process. A single batch process will take approximately 12-14 hours and will involve loading of approximately 10-12 tonnes of feedstock material into the reactor chamber. During the process heat from the gas burners is provided for only 9-10 hours. The plant is assumed to process one batch per day, five days per week.

The Small Waste Incineration Plant (SWIP), is subject to Schedule 13 of the Environmental Permitting (England and Wales) Regulations 2016 and subsequent amendments.

This report provides the supporting information for the permit application submitted to Bradford Council.

The report section numbering system matches the question numbering in the application form for ease although the report as a whole should be considered.

To accompany the permit application an air emission risk assessment using dispersion modelling has be carried out.

The application includes the following documentation:

- Environmental Permit application form - Application for a permit to operate a small waste incineration plant.
- Appendix 1 – This document
- Appendix 2 – the Air Emissions Risk Assessment
- Appendix 3 – Noise Assessment

A1 Environmental Permitting Regulations

The Environmental Permitting (England and Wales) Regulations (HMSO, 2016) (EPR) transpose the IED in UK legislation. The EPR are designed to ensure the competent authority regulates emissions, including emissions to air, from processes to minimise adverse impacts. The latest amendment was in 2018.

The EPR states that a SWIP is defined as a waste incineration plant or waste co-incineration plant with a capacity less than or equal to 10 tonnes per day for hazardous waste or 3 tonnes per hour for non-hazardous waste, as is the case for this facility.

Schedule 13 of the EPR explains that, for SWIP facilities, the regulator must exercise its relevant functions so as to ensure compliance with the following provisions of the Industrial Emissions Directive (IED):

(a) Article 5(1) and (3);

(b) Article 7;

(c) Article 8(2);

(d) Article 9;

(e) Article 42(1)

(f) Article 43;

(g) Article 45(1), (2) and (4);

(h) Article 46;

(i) Article 47;

(j) Article 48(1) to (4);

(k) Article 49;

(l) Article 50;

(m) Article 51(1) to (3);

(n) Article 52;

(o) Article 53;

(p) Article 54;

(q) Article 55;

(r) Article 82(5) and (6).

A2 The Industrial Emissions Directive (IED)

The IED (IED, 2010/75/EU), a European Union Directive, consolidated seven existing directives including the Waste Incineration Directive (WID) into a single directive. Chapter IV of the IED applies to incineration and co-incineration plants (which accept waste and other fuels such as biomass) which thermally treat waste as defined in the Waste Framework Directive. The IED defines requirements for facilities classified as waste incinerators under the IED definition. The IED also defines emission limit values (ELVs) for emissions to air and water.

The following provides a summary of the relevant articles, although is not exhaustive in content. The competent authority for SWIP is the local authority, in this instance Bradford Council.

Article 5 relates to the requirements on the competent authority for granting of a permit.

Article 7 relates to incidents and accidents and requires:

(a) the operator informs the competent authority immediately;

(b) the operator immediately takes the measures to limit the environmental consequences and to prevent further possible incidents or accidents;

(c) the competent authority requires the operator to take any appropriate complementary measures that the competent authority considers necessary to limit the environmental consequences and to prevent further possible incidents or accidents.

Article 8(2) relates to non-compliance and requires, in the case of a breach of the permit conditions:

(a) the operator immediately informs the competent authority;

(b) the operator immediately takes the measures necessary to ensure that compliance is restored within the shortest possible time;

(c) the competent authority requires the operator to take any appropriate complementary measures that the competent authority considers necessary to restore compliance.

Article 9 relates to requirements in regards to emission of greenhouse gases.

Article 42 details the special provisions for waste incineration plant. This is part of Chapter IV of the IED. The chapter states:

This Chapter shall not apply to gasification or pyrolysis plants, if the gases resulting from this thermal treatment of waste are purified to such an extent that they are no longer a waste prior to their incineration and they can cause emissions no higher than those resulting from the burning of natural gas.

While the process is a pyrolysis plant, gas from the pyrolysis process is combusted to provide heat to the reactor and thus the process is considered an incinerator.

For the purposes of this Chapter, waste incineration plants and waste co-incineration plants shall include all incineration lines or co-incineration lines, waste reception, storage, on site pretreatment facilities, waste-, fuel- and air-supply systems, boilers, facilities for the treatment of waste gases, on-site facilities for treatment or storage of residues and waste water, stacks, devices and systems for controlling incineration or co-incineration operations, recording and monitoring incineration or co-incineration conditions.

If processes other than oxidation, such as pyrolysis, gasification or plasma process, are applied for the thermal treatment of waste, the waste incineration plant or waste co-incineration plant shall include both the thermal treatment process and the subsequent incineration process.

Article 45 sets out what will be included as part of the permit conditions

1. The permit shall include the following:

(a) a list of all types of waste which may be treated using at least the types of waste set out in the European Waste List established by Decision 2000/532/EC, if possible, and containing information on the quantity of each type of waste, where appropriate;

(b) the total waste incinerating or co-incinerating capacity of the plant;

(c) the limit values for emissions into air and water;

(d) the requirements for the pH, temperature and flow of waste water discharges;

(e) the sampling and measurement procedures and frequencies to be used to comply with the conditions set for emission monitoring;

(f) the maximum permissible period of any technically unavoidable stoppages, disturbances, or failures of the purification devices or the measurement devices, during which the emissions into the air and the discharges of waste water may exceed the prescribed emission limit values.

Article 46 details the requirements for control of emissions. It:

- sets out emission to air limits which cannot be exceed (the emission limit values are set out in parts 3 and 4 of Annex VI);
- requires discharges to the aquatic environment of waste water to be limited as far as practicable and sets emission limits (the emission limit values set out in Part 5 of Annex VI); and
- requires plant sites to prevent the accidental release of polluting substances into soil, surface water and groundwater (the emission limit values set out in Part 5 of Annex VI).

Article 47 details the requirements and expectations should the facility breakdown

Article 48 specifies the requirements of the monitoring of emissions and includes the following requirements:

- the monitoring of emissions must be carried out in accordance with parts 6 and 7 of Annex VI;
- the measuring systems shall be subject to control and to annual surveillance tests as set out in point 1 of Part 6 of Annex VI;
- the competent authority shall agree to the location of the sampling or measurement points to be used for monitoring of emissions and
- all monitoring results shall be recorded, processed and presented in such a way as to enable the competent authority to verify compliance with the operating conditions and emission limit values which are included in the permit.

Article 49 states the requirement for compliance with emission limit values. And the emission limit values for air and water shall be regarded as being complied with if the conditions described in Part 8 of Annex VI are fulfilled.

Article 50 sets out the requirements for the operating conditions.

The incineration must be carried out such that:

- the total organic carbon content of slag and bottom ashes is less than 3 % or their loss on ignition is less than 5 % of the dry weight of the material. If necessary, waste pre-treatment techniques shall be used.
- the gas resulting from the incineration of waste is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of at least 850 °C for at least two seconds.
- each combustion chamber should be equipped with at least one auxiliary burner. This burner shall be switched on automatically when the temperature of the combustion gases after the last injection of combustion air falls below the temperatures set out in paragraph 2. It shall also be used during plant start-up and shut-down operations in order to ensure that those temperatures are maintained at all times during these operations and as long as unburned waste is in the combustion chamber.
- any heat generated shall be recovered as far as practicable.

Article 51 states that competent authorities have the authorisation to change operating conditions from those set out in the chapter providing a number of requirements are met.

Article 52 sets of the requirements with regards to delivery and reception of waste and includes the following:

- the operator shall take all necessary precautions concerning the delivery and reception of waste in order to prevent or to limit as far as practicable the pollution of air, soil, surface water and groundwater as well as other negative effects on the environment, odours and noise, and direct risks to human health; and
- the operator shall determine the mass of each type of waste

Article 53 details the requirements regarding residues and includes the following:

- residues shall be minimised in their amount and harmfulness;
- residues shall be recycled, where appropriate, directly in the plant or outside;
- transport and intermediate storage of dry residues in the form of dust shall take place in such a way as to prevent dispersal of those residues in the environment; and
- prior to determining the routes for the disposal or recycling of the residues, appropriate tests shall be carried out to establish the physical and chemical characteristics and the polluting potential of the residues. Those tests shall concern the total soluble fraction and heavy metals soluble fraction.

Article 54 set out what is considered a substantial change.

Article 55 details the reporting and information requirements.

Article 82 sets out the transitional provisions, however, as it is a new plant these are not relevant and all dates specified in the article have passed.

B Site Location and Plans

The facility is located in the western part of Bradford city within a predominately industrial area. The address is 544 Duncombe Road, Bradford and the facility location is shown in Figure 1.

The site is located within an industrial area of west Bradford. There is a flexible power generation facility adjacent to the site which will generate air emissions in the local area.

There are few human health receptors in the immediate vicinity of the site, most being outdoor areas like pavements where members of the public are unlikely to spend significant periods of times. There is, however, a school approximately 150 m to the east, and residential properties approximately 200 m to the northwest, 180 m to the southwest, 500 m to the north and 500 m to the east.

Bradford Council has investigated air quality within their area as part of their responsibilities under the Local Air Quality Management regime. The Council has declared four Air Quality Management Areas (AQMAs), all for exceedences of annual mean nitrogen dioxide air quality objective. The nearest AQMA is 1.9 km to the northeast of the facility as shown in Figure 1. The AQMAs represent areas where there is human health exposure to unacceptable pollution levels.

In addition to human receptors in the local area, there are potentially sensitive ecological habitats. Within 2 km of the site there are no locally designated ecological sites (local nature reserve (LNR) or ancient woodland (AW)) or nationally designated ecological sites (national nature reserve (NNR) or Site of Special Scientific Interest (SSSI)). However, within 10 km of the facility is the South Pennine Moors which is a Special Area of Conservation (SAC), Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) which may be sensitive to small changes to due to pollutant air emissions from the facility. This site is shown in Figure 2. The is also the potential for local waterways to be impacted by any emissions to water, although there are not designated ecological sites within the immediate area surrounding the site.

All proposed operations will be contained within the site ownership boundary shown in Figure 3.

A figure showing the proposed building configuration and layout of the activities on the site has been provided in Figure 4.

Figure 1: Site location

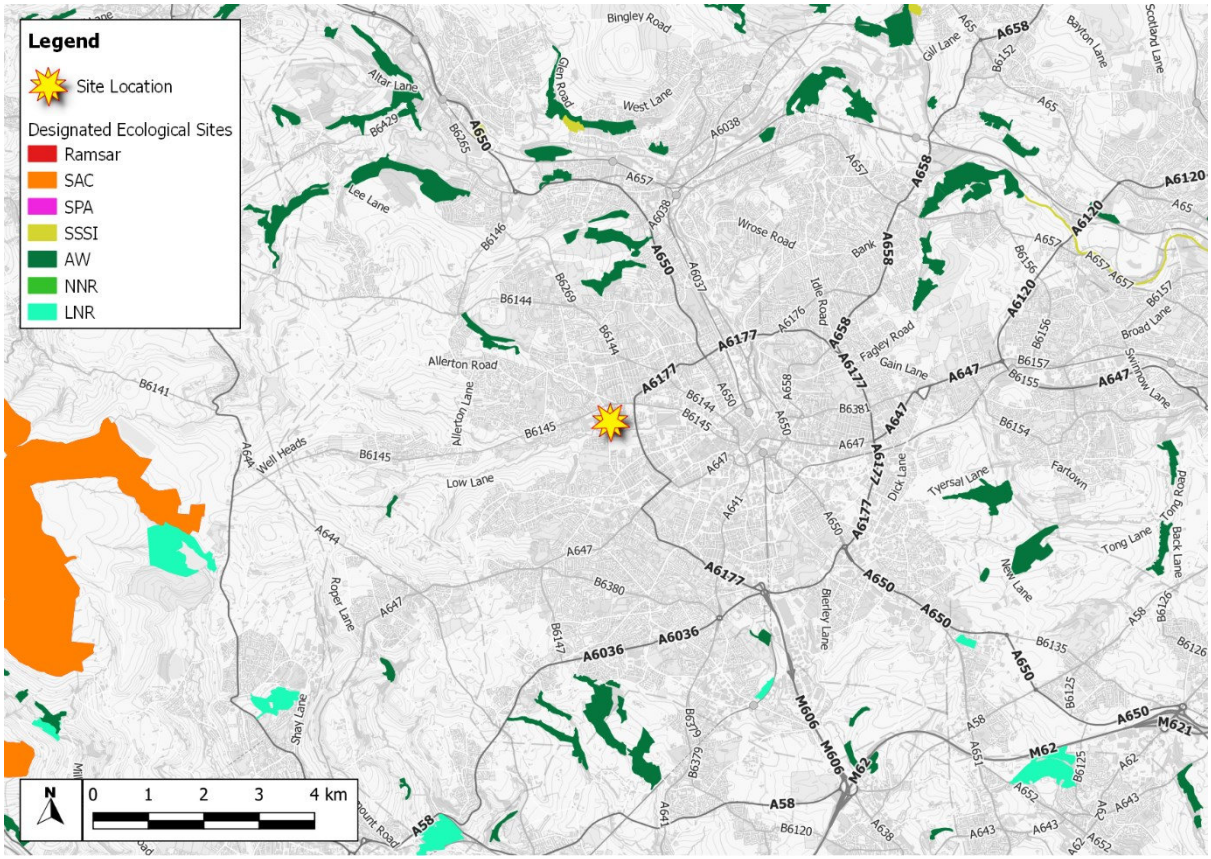


Figure 2: Ecological sites

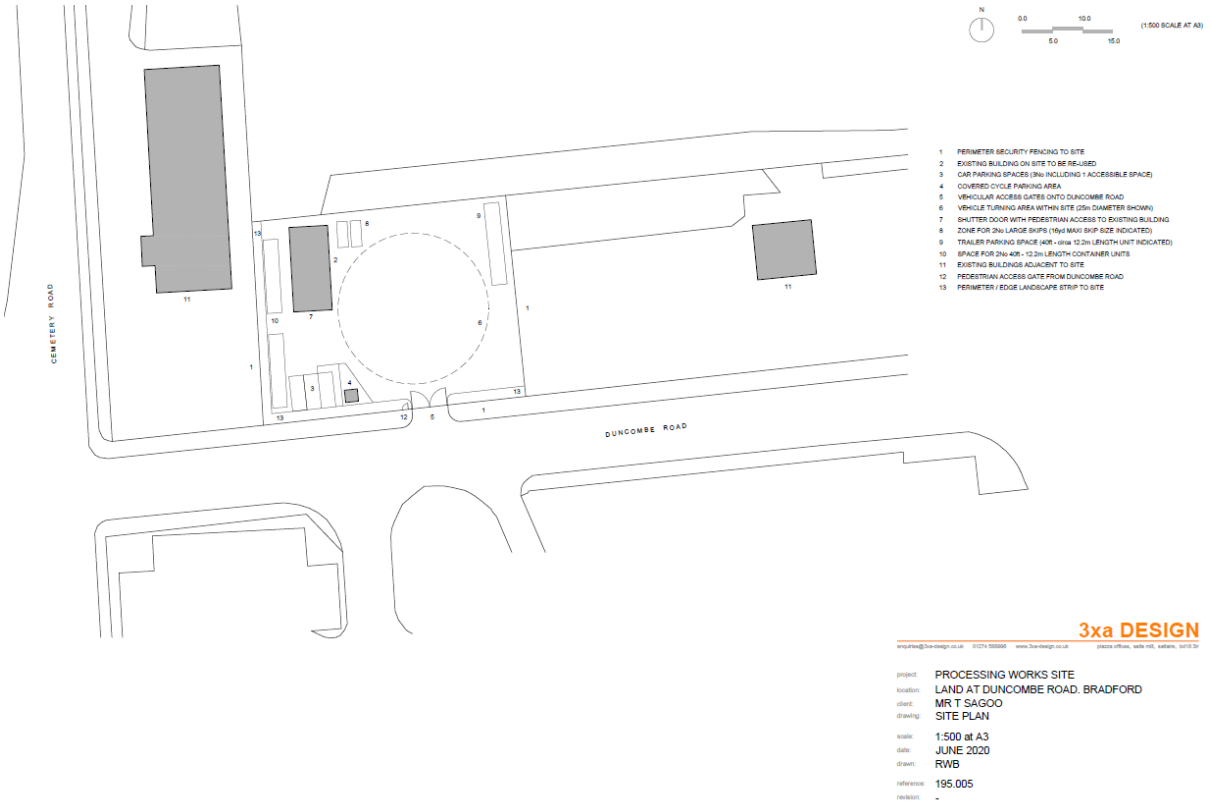


Figure 3: Site boundary plan

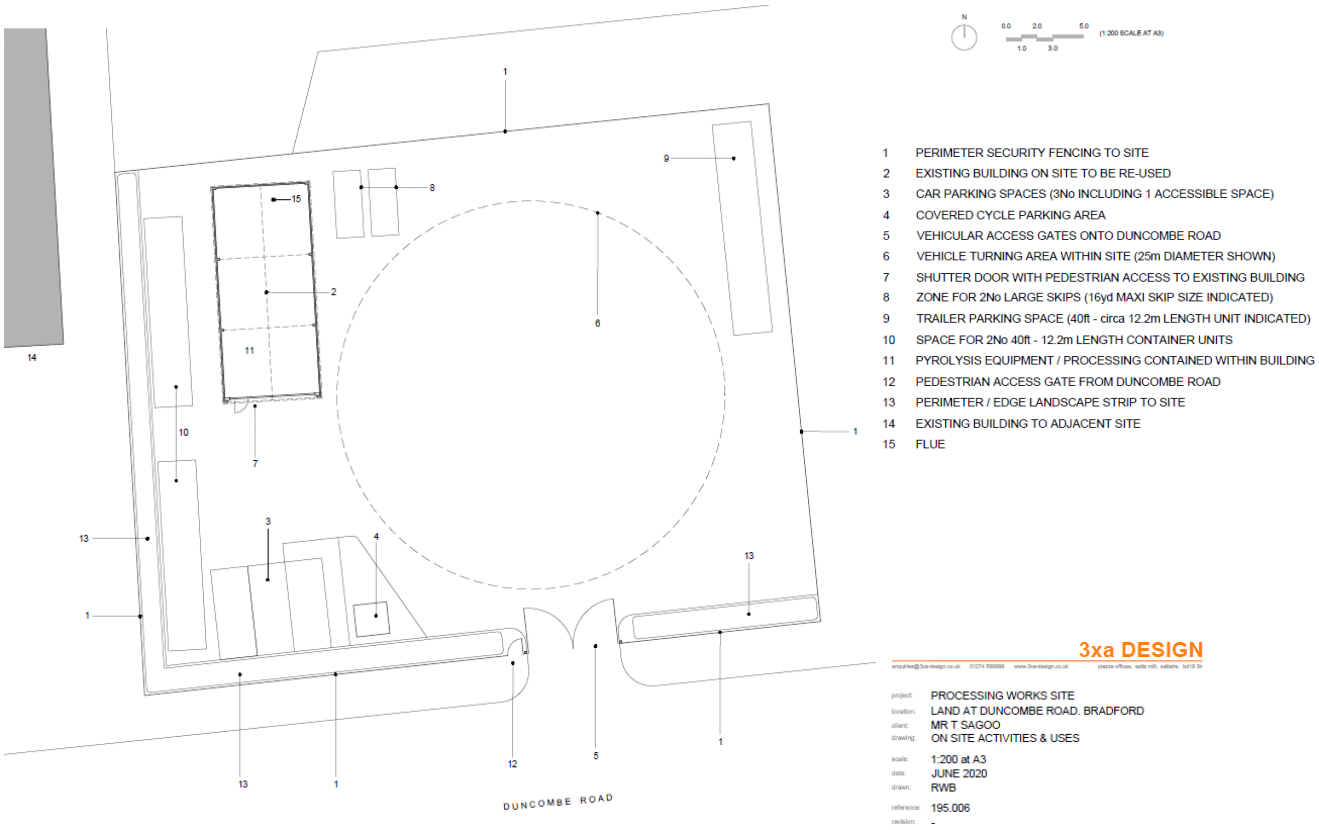


Figure 4: Building configuration and layout of onsite activities

C Waste types and activities

C1 Waste types to be incinerated

Table 1 sets out a complete list of waste types to be used in the plant.

Waste shall not be accepted at the site which has any of the following characteristics:

- Hazardous Waste
- Consisting solely or mainly of dust or liquids
- Defined as infectious

Table 1

Waste code	Description	Source	Quantity (T per annum)
20.0139	Mixed Plastics, Civic Amenity Waste	Contract	Not to exceed permit
20.0.01	Domestic Waste, Industrial, Commercial Waste, Mixed Waste	Contract	Not to exceed permit
16.01.03	Tyres in Tact	Contract	Not to exceed permit
19.12.04	Tyres Shred	Contract	Not to exceed permit

C2 Delivery and reception of waste

C2.1 Proposed waste reception and handling arrangements

Prior to processing, all wastes accepted at the facility will be subject to stringent waste acceptance criteria in accordance with the Company's Environmental Management System and associated procedures.

Waste will arrive with a pre-allocated appointment. On arrival, accompanying documents will be checked and verified. Waste materials will arrive to site by a curtain sided trailer. Once all documents have been checked on arrival, site staff will direct the driver to the unloading area, which is an uncovered area. The waste arrives at the facility packaged as bales and, in some cases, wrapped. The bales are unloaded using a fork-lift truck and moved to the storage location which is covered or directly into the plant for the process.

The waste stored on site will account for the best practice measures set out in the BREF on Emissions from Storage (EFS BREF), published in July 2006.

C2.2 Preventing and minimising the pollution of land, air and water

Minimal waste is stored onsite reducing the risk of emissions from the waste stored. However, the handling of waste during arrive may result in small emissions and where practicable the risk of those emissions will be minimised.

The primary approach to minimising the risk of emissions during delivery and reception is be pre-processing the waste off-site by contractors who deliver the waste baled to site. As the process is a batch process which uses baled waste there is minimal handling of the waste which reduces the risk of pollution emissions.

The process is designed to be an on demand system, where as waste arrives at site it is loaded into the plant for processing immediately. However, there may be occasions where the waste is stored on site. All waste is delivered to the facility baled and is expected to be stored on site for more than 2 weeks. Once delivered the goods will be stored in a covered storage area.

C2.2.1 Emissions to Land

During the delivery and receipt of the waste, there is not expected to be a risk of emissions to land.

C2.2.2 Emissions to Air

During the delivery and receipt of the waste, there is a low risk of there being emissions to air.

Delivery vehicles will be required to turn off their engines for unloading thus there will be no pollutant emissions from the vehicles.

The waste will be pre-processed and baled off-site. Some waste will be wrapped. Because the waste is baled there is minimal handling and disturbance of the waste during delivery. As such there are not anticipated to be any significant emissions to air during delivery.

Once inside the facility, the main doors will be closed to minimise the potential for fugitive dust emissions.

C2.2.3 Emissions to Water

During the delivery and receipt of the waste, there is a low risk of there being emissions to water.

Fully covered, no risk of rainwater leaching pollutants into the local waterways.

There will be no process emissions to controlled water arising from the delivery and receipt of the waste.

C2.3 Preventing and minimising noise and odour and other potential risks to human health

C2.3.1 Noise

During the delivery and receipt of the waste, there is a small risk of additional noise being generated.

Deliveries will generally be schedule for times of day when the local area is less sensitive to noise levels.

During deliveries the plant is unlikely to be operational as the deliveries are scheduled to arrive and be loaded directly into the reactor. Therefore there is unlikely to be the combined effect of noise form the process and from delivery of the waste.

A noise assessment for the operation of the facility has been carried out and is attached to this report.

The most significant potential for noise is anticipated during the delivery of waste, and The End Journey Ltd will use its best endeavours will minimise noise which can be associated with deliveries via walking floor delivery vehicles and require all delivery vehicles to turn their engines off while on site. The fork-lift truck will be electric and low noise.

C2.3.2 Odour

During the delivery and receipt of the waste, there is a low risk of odour emissions.

The type of waste delivery to side is generally considered low-odour waste. As the waste is baled prior to delivery to side there will be minimal handling and disturbance of the waste during the unloading of the bales.

All wastes will be delivered in a covered trailer and delivered directly into the processing area. As the material will be deliver on a curtain sided trailer, this will restrain any odours. However, the type of material for recovery should be odour free.

The waste will be stored in a covered and enclosed area, minimising the risk of odour impacts.

No odorous materials will be accepted onto the site and therefore the potential for offsite odour impacts is considered negligible.

C2.3.3 Pollution Prevention

During the delivery and receipt of the waste, there is minimal other risk to human health.

C3 Mass of received waste

The waste will be weighed prior to delivery to determine the mass. No onsite weighing will be carried out.

C3.1.1 Measurement of the incoming waste

Waste will be delivered to the facility pre-baled and pre-weighed off-site. The delivery will include transfer notes providing details of the mass.

C3.1.2 Information about waste arriving at the site

Prior to arrival each delivery will be scheduled. Upon arrival transfer notes for each delivery will be logged and recorded which will detail the mass and type of waste delivered to the facility.

C3.1.3 Details of waste accepted and collected

Materials will be contracted by Pre-Selection. Waste types accepted at the facility are detailing Section C1 of this report.

C3.1.4 Documentation Checks

Accompanying documents will be cross referenced by visual inspection of the number of Bales and description. All documents will be signed as received and checked, dated and kept as a record.

C3.1.5 Suitability of the waste for combustion, including physical and chemical information

Waste will be Pre-approved for combustion suitability and where necessary scientific analysis will be requested by the operator and can be provided to the competent authority upon request. Details of the typical fuel composition used with the plant are set out in section D1.

C3.1.6 Precautions to be taken in handling the waste

All material is non-hazardous and is therefore relatively safe to handle.

All material will be handled by small Fork-lifts or similar size Bobcat.

The operator will carry of a COSHH assessment, H&S assessment and fire risk assessment as part of their obligations to the staff on site.

Appropriate measures will be determined in the assessments and relevant personal protective equipment (PPE) will be used.

C3.1.7 Sampling of waste to be undertaken to check that the documentation is accurate

All waste is delivered to site pre-processed.

Spot samples will be carried on the waste following the guidelines.

D The small waste incineration plant

D1 Description of plant

The facility comprises of a batch pyrolysis plant which utilises gas produced by the process to provide the heat for the pyrolysis to occur and as such is considered an incineration plant. The facility will include ancillary infrastructure including a loading and storage area. The pyrolysis plant is located within an enclosed metal clad building.

The system is a batch process and the facility is designed such that waste arriving on site will be loaded into the reactor chamber at the point of delivery. On occasion the waste may be store for short periods on site. Waste material is stored in a covered storage area, prior to being loaded into the reactor chamber.

D1.1 Pyrolysis

Pyrolysis is a thermochemical treatment, which can be applied to any organic (carbon-based) product. It can be done on pure products as well as mixtures. In this treatment, material is exposed to high temperature, and in the absence of oxygen goes through chemical and physical separation into different molecules. The decomposition takes place thanks to the limited thermal stability of chemical bonds of materials, which allows them to be disintegrated by using the heat.

Pyrolysis is frequently associated with thermal treatment. But in contrary to combustion and gasification processes, which involve entire or partial oxidation of material, pyrolysis bases on heating in the absence of air. This makes it mostly endothermic process that ensure high energy content in the products received.

Pyrolysis processes always produce solids, liquids and non-condensable gases:

- Solids:
  - Carbon black (30% TO 35% recovery of process).
  - Metal recovery. For example steel present in waste rubber tyre can be detached after the pyrolysis recycling process is completed.
- Liquids:
  - The main product is oil (37% -42% pyrolysis process pyro-oil). There are 2 types of oil from the process, normal oil and heavy oil:
    - Heavy oil is about 2 % to 4% of the total output.
    - The final percentage is about 38 % to 42 % dependent on the feedstock.
- Gases:
  - Pyro-gas or syn-gas (approximately 10%). Pyrolysis gas is produced during the process, about 3 hours after the process starts. The main component of it is methane (CH4) which is non-condensable as it is combustible at room temperature. This gas is used in completion of the process where it use to fuel the gas-burners providing heat to the reactor. Excess gas is burnt or used for heating other applications.

During the pyrolysis, a particle of material is heated up from the ambient to defined temperature. The material remains inside the pyrolysis unit until the completion of the process. The chosen temperature of pyrolysis defines the composition and yields of products (pyrolysis oil, syngas and char).

D1.2 Process

The batch pyrolysis plant will be the same specification as plant currently in operational in India but made in the UK. Testing has been carried out on this identical equipment which will be used in this SWIP by the manufacturers located in India and the emissions from that testing are considered the most representative emissions providing the feedstock is similar in content. The system in India uses a single stage wet scrubber in the abatement system, and the proposed SWIP includes additional stages of abatement further reducing any emissions compared with the measurement of the plant in India.

A detailed description of the pyrolysis process with an illustration is provided below.

1. A reactor chamber is heated using two gas burners. When the reactor has reached its temperature (550°C), the feedstock is loaded into the reactor by an auto-feeder. The pyro-gas generated from the reactor during the first 3 to 4 hours of pyrolysis goes through the catalyst chamber, where the impurities and the paraffin are removed. The burner temperature is increased to exceed 850°C for at least 2 second prior to the end of the process.

2. Thereafter, the pyro-gas goes through the condenser that has a cooling pipe system filled with water that is completely separated from the pyro-gas. It does come in contact with the pyro-gas such as done for glycol cooling system. The pyro-gas condense in the condenser into an oil component and the remaining (non-condensable gases) go toward the dedusting system.

3. The oil-water separator is a safety device, which prevents the non-condensed pyro-gas from returning to the reactor.

4. The oil goes to an oil tank from the condenser. This small oil tank is regularly emptied towards a large oil tank.

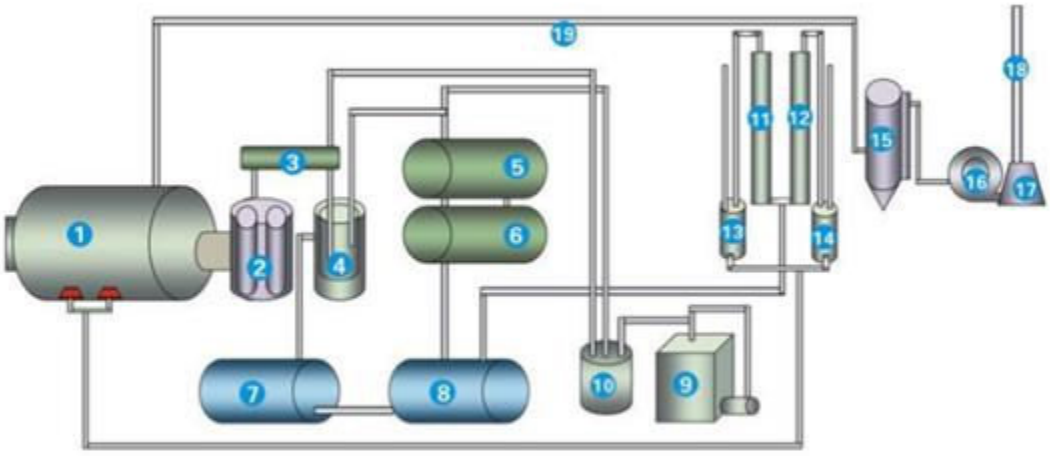
5. For the remaining non-condensable gases (CH_4, C_2H_6, C_3H_8, C_4H_{10}, H etc.), they will go through the anti-back fire device, and stored in a storage container to be burned as energy for the reactor for the next batch process

6. The gases that were not flared nor dust condensed into oil, will pass through a new technology dust removing system made by Robin Hood Prithvi Group (RHPG) company for dedusting and removing almost completely the leftover sulphuric gas. The dedusting system will ensure that no smoke will go through the chimney. This process takes 12 to 14 hours.

7. Once the reactor has cooled down, the 12 m screw char discharging device will be used to remove the char and the metal from the reactor. This char is bagged and transported off site.

8. The reactor has to be completely cooled down before opening it to remove the metal and recharging again.

9. Steel wires from using rubber types will be discharged at the end of the pyrolysis process by using a hook. Metals from other process will be collected by a similar method.



1.Reactor 2.Catalyst room 3.Condenser pipe 4.Oil-water separator 5.Horizontal condenser A 6.Horizontal condenser B 7.Oil tank A 8.Oil tank B 9.Vacuum device 10.Buffer tank 11.Waste gas condensing tower A 12.Waste gas condensing tower B 13.Anti-back fire device A 14.Anti-back fire device B 15.Dedusting device 16.Draught fan 17.Dedusting tank 18.Chimney 19.Flue

Figure 5: Process

Table 2: Plant Technical Parameters

Equipment Type	PRIMA-010
External Dimension of Main Machine (Reactor)	6800 (L) x 2600 (D)
Batch capacity	10 tons raw material
Raw Material	Municipal Waste/Tyre/Plastic
Initial Fuel	Gas, Oil, Pyro Water
Per Batch Oil yield (40-45%)	4.5 tons fuel oil
Carbon Black (30-35%)	3.5 tons carbon black
Steel Wire (10-15%)	1.5 tons steel wire
Gas (12-15%)	1.5 tons gas
Structural form	Horizontal rotation
Rotation Speed of Main machine	0.4 turn/minute
Kind of Drive	External internal drive
Type of Door	Full opening
Operating Pressure	Normal
Mode of Cooling	Water cooling
Consumption of Cooling Water	Cyclic
Heating Method	Direct heating
Power (HP)	40
Noise dB(A)	<85
Working Form	Intermittent operation
Type of Installation	With foundation

Table 3: Equipment Technical Parameters

No	Name	Specification	Quantity	Remark
A	Host Part			
1	Reactor	D2600mm L6800mm T16mm Boiler Material	One Set	

2	Feed Hole	D1400mm L600mm T20mm	One Piece	
3	Oil Outlet(rotor)	D630mm L1000mm T20mm Steel Plate	One Piece	
4	Built in Spiral Plate	H100mm Thick Steel Plate	1 Set	
5	Dust Removal Device	D325mm Flange	1 Set	
6	Support	Channel Plate	2 Piece	
7	Support Roller	D200mm L250mm Quality Bearings (water cooling system)	4 Piece	
8	Main Door Hinge			
9	Main Door Customize Square Thread I-Bolt		19 Piece	
10	Chain Sprocket Technology			
11	Expansion Bellow			
12	Furnace	Casting & Assembly by Refractory Cement		
13	Flow Lines (stator)	D 126mm L500mm T12mm Steel Plate	1Piece	
14	Grate	L1100mm Casting	15 roots	
15	Platen (seal device)	D600mm T18mm Flange	1 Piece	
16	Power Motor	5 HP (Kirloskar)	1 Set	
17	Moto Reducer Gear Box	50:1	1 Set	
18	Pressure Gauge		1 Piece	
19	Thermocouple		1 Piece	
20	Thermal Sensor Cable		10 meters	
21	Temperature Gauge		1 Piece	
22	Furnace Door	Casting	2 Piece	
23	Safety Device	Safe Valve/Alarm Device	2 Piece	
24	Pressure/Temperature Gauge on Main Door	Main Door of Reactor		
25	Winch		1 Piece	
26	Sight Glass	150 Class	5 Piece	
27	Sight Glass	400 Class	1 Piece	
28	Oil Level Meter		3 Piece	
29	AC Contactor		1 Block	
30	Pressure Controller		1 Block	
31	Electronic Control Box		1 Piece	
B	Catalytic & Cooling Part			

1	Catalytic Chamber	D800mm L2000mm	1 Piece	
2	Cooling Tube	D325mm/D600mm L3500mm	1 Piece	
3	Down Oil Tube	D325mm	1 Piece	
4	Up Oil Tube	D325mm	1 Piece	
5	Condenser	D800mm H2600mm T6mm D600mm H2600mm T6mm	4 Piece 1 Piece	Total 5 Piece
6	Oil Water Separator	D960mm H1500mm T6mm	1 Piece	
7	Oil Tank	D960mm L1500mm D960mm L3000mm D1300mm L3000mm	1 Piece 1 Piece 1 Piece	Total 3 Piece
8	Exhaust Up Channel	D159mm	1 Piece	
9	Exhaust Down Channel	D159mm	1 Piece	
10	Steel Tube (oil Tube)	2 inch	6 meter	
11	Cover Plate	D325mm	3 Piece	
		D273mm	3 Piece	
		D219mm	6 Piece	
		D 159 mm	1 Piece	
12	Water Cooling Cover	D800 mm D600mm	4 Piece 1 Piece	
13	Water Feeding Cover	D600mm	piece	
14	Outside Water Pool OF the Furnace	Water Pool		Self
C	Exhaust Recycling			
1	Closed Firearms (Water Sealing)	D600mm H1000mm T5mm	1 Piece	
2	Burner		3 Sets	
3	Φ 158 Short Tube	D158 mm (with flange)	1 Piece	
D	Other Accessories			
		2 Inch check Valve	5 Piece	
		1 Inch half valve	30 Piece	
1	Flange	1.5 Inch Valve	22 Piece	
		Safety Valve	2 Piece	
E	Dust Removal in Addition to Taste Environment Protection System			
1	Draft Fan	Stainless Steel	1 Set	
2	Dust Removal Device (Scrubber)	900mm × 2600mm	1 Set	
3	Chimney Pipe	40 Feet		
4	Motor	2.2 kw	1 Set	

		(Kirloskar)		
5	Support		1 Piece	
6	Chimney Base		1 Piece	
7	Blower Elbow	D273	5 Piece	
8	Blower Flange	D273	10 Films	
9	Bell		1 Piece	
10	Throttle Adjustment		1 Piece	
11	Φ 108 Tube	D108(With Elbow)	1 Piece	

D1.2.1 Plant Start up and Shut Down

1. Visual inspection check oil tanks are clear
2. Distance pipe should be clean and clear
3. Gland rope should be safe and secure
4. Water level should be maintained in water shield tank, gas tank and water tank
5. Secure man chamber gate, carbon door should be torqued down
6. All valves should be closed, except main chamber and insulation tank temperature reaches 100 degrees
7. After steps above have been carried out, start firing
8. After firing machine, approximately 3-hour gas generated shall be used in reactor for heating. Next approx. 6-7-hour process should be finished
9. When process is completed then transfer oil and hard oil into moisture clearing tanks
10. After 12 hours, oil should be clear and it can be transferred into the main oil tank
11. System should be left to cool down. Open the main door valve and first insulation tank valve
12. Start cooling blower for rapid cooling process (takes 5-6 hours)
13. After cooling reactor, open carbon door and discharge carbon. After 3 hours open carbon door
14. After discharging reactor, inject reactor nitrogen gas into the boiler for cooling chamber then open main door for discharging wire from the reactor
15. Finally remove all metals from chamber

D1.2.2 Safety Precautions

1. Before opening the main door and carbon door, system temperature should be below 60 degrees
2. PPE MUST BE WORN AT ALL TIMES
3. Plant should run on proposed temperature and pressure

D1.3 Waste Fuel

The specific waste composition is not known, however, the facility will predominately operate on either waste rubber tyres or RDF, although all waste types specified in section C1 may be used. The RDF and rubber tyre waste feedstock is assumed to have a typical composition as presented in Table 4 and Table 5. The net calorific value of the rubber tyres (as received) is assumed to be 31.55 MJ/kg. The net calorific value of the RDF (as received) is assumed to be 17.40 MJ/kg. The RDF has a much lower calorific value than the rubber tyres.

Table 4: Fuel composition – Rubber Tyres

Parameter		As Received (ar)	Dry Basis (dry)	Dry Ash Free (daf)
%Mass	Carbon	79.95%	81.16%	86.89%
	Hydrogen	6.99%	7.10%	7.60%
	Nitrogen	0.25%	0.25%	0.27%
	Oxygen	3.27%	3.32%	3.55%
	Sulphur	1.56%	1.58%	1.69%
	Chlorine	6.50%	6.60%	86.89%
	Fluorine	79.95%	81.16%	7.60%
	Ash	6.99%	7.10%	-
	Moisture Content	0.25%	-	-
	Total	100.00%	100.0%	100.00%
Net Calorific Value (LHV) (MJ/kg)		31.55	32.06	-
Gross Calorific Value (HHV) (MJ/kg)		33.11	33.61	35.98

Table 5: Fuel composition – RDF

Parameter		As Received (ar)	Dry Basis (dry)	Dry Ash Free (daf)
%Mass	Carbon	46.20%	49.23%	59.19%
	Hydrogen	7.65%	8.15%	9.80%
	Nitrogen	1.71%	1.82%	2.19%
	Oxygen	22.27%	23.73%	28.53%
	Sulphur	0.23%	0.24%	0.29%
	Chlorine	15.78%	16.82%	59.19%
	Fluorine	6.16%	49.23%	9.80%
	Ash	46.20%	8.15%	-
	Moisture Content	7.65%	-	-
	Total	100.00%	100.0%	100.00%
Net Calorific Value (LHV) (MJ/kg)		17.40	18.70	-
Gross Calorific Value (HHV) (MJ/kg)		19.22	20.48	24.62

D1.4 Abatement and controls

D1.5 Abatement and controls

D1.5.1 Emissions to air

Emissions to air come from releases from the waste itself prior to use, emissions from the exhaust flue during the process and emissions from any suspended particles during dry cleaning and sweeping. The facility will include abatement and controls to minimise the release of pollutant emissions to air.

The air emissions control system uses:

- Burner controls
- A venturi scrubber
- A three-stage filter including a pre-filter for large particles, a carbon filter and then a HEPA filter.

The emissions (including NOx) will initially be reduced through control of temperature, gas mixing and air supply. The exhaust gases will then pass through a number of stages designed to remove pollutants.

Stage 1:

Venturi scrubbing is a most effective technique for the removal of particulates from a gas stream, even down to sub-micron size. Scrubbing liquor and gas stream are brought together in turbulent contact within the venturi throat and the particulates are forced into the atomised liquor.

The scrubbing liquor (water) has caustic (sodium hydroxide) added to it via a dosing system. This will be required to remove any acid gases that maybe present (HCl, HF, NOx, SO_2). The scrubber will be designed to remove 70-80% of pre-abatement HCl, 60% of pre-abatement HF, 30% of pre-abatement NOx and 60-70% of pre-abatement SO_2.

The venturi scrubber is designed to removed > 90% of the total dust, which includes fine airborne particulate matter (2.5 to 10 micron).

Metals in incineration are converted mainly into non-volatile oxides and deposited with fly ash. Thus, the main techniques of reduction in the flue system are those applicable to dust removal.

This single venturi scrubber should reduce emissions, where present, to the BREF BAT emissions levels set out in Table 5.

Stage 2:

As a precautionary approach, due to the new technology, an additional 2nd wet scrubber which is a packed tower scrubber will be used inline after the venturi scrubber to further improve removal efficiencies for NO_2, SO_2, HCl, HF.

Stage 3:

After the 2nd tower scrubber, the gases will pass through a three-stage filtration process (the process is shown in Figure 7) involving:

1) A pre-filter to capture suspended particles and dust
2) An activated carbon filter which can absorb and catch pollutants contained in the gases including VOCs
3) A HEPA filter which removes chemicals in the gas.

These filters need to be replaced periodically as they get dosed and blocked.

Stage 4 (if required):

The wet scrubber and activated carbon filter are also effective at removing odour emissions. If needed a further activated carbon filter to remove additional odour emissions will be installed although it is not expected this will be required. This system, if needed, can remove up to 95% of the odour from the exhaust gas using activated carbon. An example of the odour filter which will be used is shown in Figure 8.

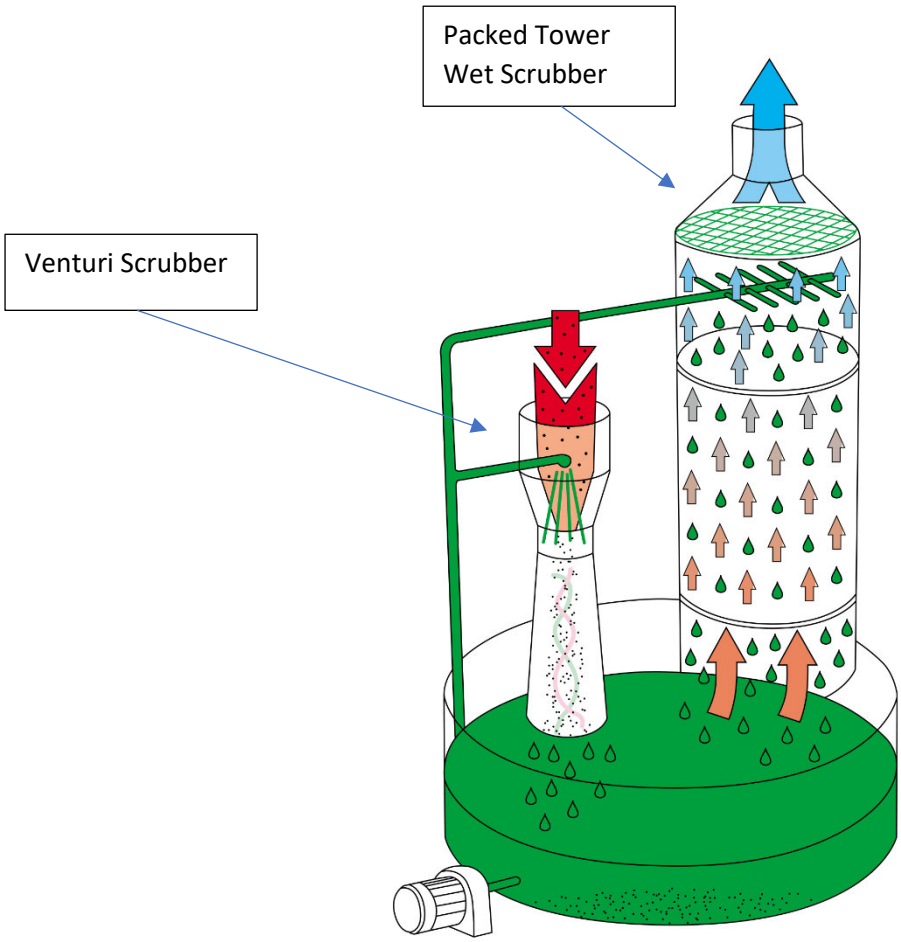


Figure 6: Venturi scrubber (left) and packed tower scrubber (right)

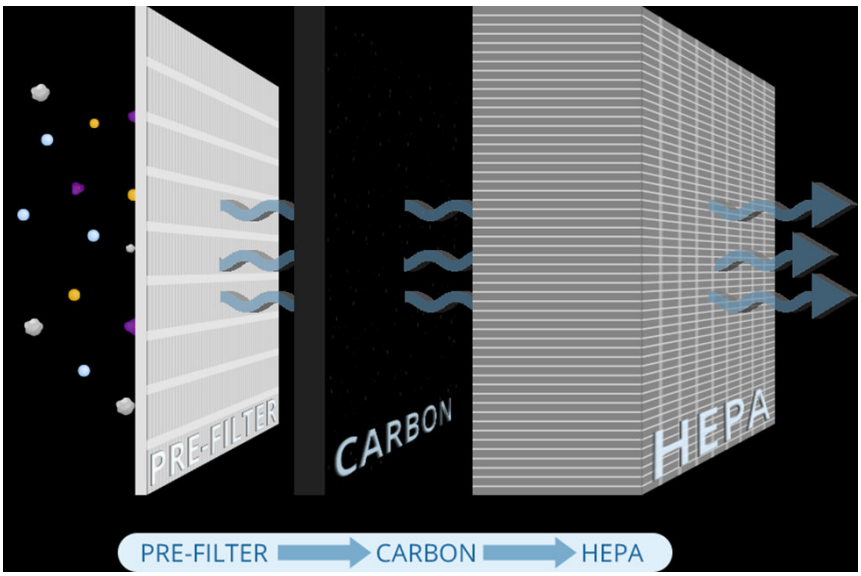


Figure 7: Three-stage filtration

Figure 8: Additional odour abatement filter – activated carbon

D1.5.2 Emissions to water

Emissions to water come from cleaning of the system, cleaning of surfaces, from any wet FGC system used, water run-off from any rainwater passing through the waste. The facility will include abatement and controls to minimise the release of pollutant emissions to water. The abatement and control systems include:

- use of segregated drainage to enable direct discharge of clean rainwater from roofs and other clean surfaces; and
- separate treatment of wastewater from the first and last steps of the scrubbing system plant used water in an Effluent Treatment Plant (ETP) for recycling of plant waste water.

Figure 9: Effluent Treatment Plant example picture

D1.5.3 Noise

A noise assessment has been carried out.

The facility incorporates a noise reduction and control systems. The system is designed to minimise the risk of significant increased noise impacts

D1.6 Plant Start up and Shut Down

The following set out the process for start-up and shut-down of the process.

1. Visual inspection check oil tanks are clear
2. Distance pipe should be clean and clear
3. Gland rope should be safe and secure
4. Water level should be maintained in water shield tank, gas tank and water tank
5. Secure man chamber gate, carbon door should be torqued down
6. All valves should be closed, except main chamber and insulation tank temperature reaches 100 degrees
7. After steps above have been carried out, start firing
8. After firing machine, approximately 3-hour gas generated shall be used in reactor for heating. Next approx. 6-7-hour process should be finished
9. When process is completed then transfer oil and hard oil into moisture clearing tanks
10. After 12 hours, oil should be clear and it can be transferred into the main oil tank
11. System should be left to cool down. Open the main door valve and first insulation tank valve
12. Start cooling blower for rapid cooling process (takes 5-6 hours)
13. After cooling reactor, open carbon door and discharge carbon. After 3 hours open carbon door
14. After discharging reactor, inject reactor nitrogen gas into the boiler for cooling chamber then open main door for discharging wire from the reactor

15. Finally remove all metals from chamber

D2 Chimney height calculation and dispersion modelling

A screening tool is available to consider an appropriate chimney height for a facility, this is called the D1 Stack Height calculation guidance and is a simplified technique. However, where more detailed analysis is carried out this supersedes outcomes from the D1 screening tool.

A detailed dispersion model assessing the risk of air emissions on the local environment and has been carried by Air Pollution Services as part of the application. As such there is no need or benefit in calculating the simplified screening height using the D1 guidance.

The full assessment of air emissions is set out in Appendix 2.

In the report, the impacts associated with the SWIP facility have been assessed in relation to the relevant air quality assessment levels (AQALs) set to protect human health and to protect sensitive ecosystems.

The facility will use two gas burners to provide heat to the pyrolysis reactor. Each of these burners has a thermal output of 360 kW (a net thermal input of ~360 kW).

The process is non-continuous and instead is a batch process. A single batch process will last for about 12-14 hours and will involve loading of approximately 10-12 tonnes of feedstock material During the process heat from the gas burners is provided for only 9-10 hours.

The plant is assumed to process one batch per day, five days per week. Thus, the total hours the gas burners will operate is approximately 2,600 hours per year (10 hours x 5 days per week x 52 weeks per year).

The assessment has considered an annual operation of 2,600 hours. In addition to the impacts on air quality objective receptors, consideration has been given to whether the facility will lead to compliance with the limit values being delayed.

The assessment has considered the following air emissions:

- nitrogen dioxide (NO_2);
- sulphur dioxide (SO_2);
- total dust, which includes fine airborne particulate matter (PM_{10} and $PM_{2.5}$);
- carbon monoxide (CO);
- hydrogen chloride (HCl);
- hydrogen fluoride (HF);
- Volatile Organic Compounds (VOCs);
- the following trace metals:
    - cadmium (Cd);
    - thallium (Tl);
    - mercury (Hg);
    - antimony (Sb);
    - arsenic (As);
    - lead (Pb);
    - chromium (Cr);
    - copper (Cu);
    - manganese (Mn);
    - nickel (Ni); and
    - vanadium (V).

The impacts have been predicted using the ADMS-5 dispersion model and include a range of sensitivity tests to ensure the assessment is robust. The assessment has been based on a stack height of 11 m above ground level and the pollutant emission concentrations which have been modelled and are proposed for the SWIP permit

are set out in Table 6. The 'normalised' (N) conditions refers to no moisture (dry), 11% oxygen, and 0 degrees Celsius. These are the reference conditions at which the relevant Industrial Emission Directive (IED) emissions limits are expressed. The emissions set out in Table 5 are derived from the BREF BAT emissions from the IED. Emissions measured from the same type of plant as is proposed for this SWIP, but located in India have been provided and are presented in the air emissions assessment in Appendix 2. The measurements were made on a plant with a single wet scrubber installed and the proposed SWIP includes a greater level of abatement, therefore the measurements from the plant in India are considered representative of the worst-case emissions and the proposed SWIP with the abatement set out in section D1.4 will be as good as the BREF BAT emissions.

Table 6 Facility Pollutant Emission Limits

Pollutant	Emission Limits (mg/Nm^3)
Total PM	10
TOC	3
HCl	2
HF	1
SO_2	30
NOx	50
CO	50
Group 1 metals [a]	0.005
Group 2 metals [b]	0.005
Group 3 metals [c]	0.01
Dioxins and furans [d]	0.0000001
NH_3	10
PAH [e]	0.00013
PCBs [f]	0.000000075

[a] Cadmium (Cd) and thallium (Tl)

[b] Mercury (Hg)

[c] Antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni), vanadium (V)

[d] The emission limit value refers to the total concentration of dioxins and furans calculated using the concept of toxic equivalence (TEQ).

[e] An emission rate for PAH (as B[a]P) has been taken from Figure 8.121 of the BREF (European Commission, 2019b), which presents measured emission rates at municipal solid waste incineration sites. The maximum "average" emission rate of 0.13 µg/Nm^3 from any site included in the graph has been estimated from the graph and used as the annual mean emission rate, which is considered worst-case.

[f] An emission rate for PCBs has been taken from Figure 8.117 of the BREF (European Commission, 2019b), which presents measured emission rates at municipal solid waste incineration sites. The maximum "average" emission rate of 0.75 ng/Nm^3 from any site included in the graph has been estimated from the graph and used as the annual mean emission rate, which is considered worst-case.

The relevant sensitive receptors for the assessment include both human and ecological systems. The following sets out what is considered a relevant receptor in different scenarios.

For human health receptors:

- The annual mean AQAL applies at locations where members of the public might be regularly exposed, such as building façades of residential properties, schools, hospitals and care homes.
- Places of work like factories or offices are not considered places where members of the public might be regularly exposed and therefore the AQO's do not apply at these locations.
- The 1-hour mean AQO applies at the annual mean locations of exposure and at hotels, residential gardens and any outdoor location where members of the public might reasonably be expected to

spend one hour or longer, such as busy pavements, outdoor bus stations and locations with outdoor seating.

For ecological receptors:

- Nationally designated ecological sites (Sites of Special Scientific Interest (SSSIs), Areas of Special Scientific Interest (ASSIs), National Nature Reserves (NNRs)) and internationally designated ecological sites (SAC, SPAs and Ramsar sites) are considered relevant receptors for the NOx annual mean critical level, 24-hour mean proxy critical level and annual mean critical loads.
- Locally designated sites (LNRs, local wildlife sites (LWSs) and AW) are also considered sensitive receptors, however, they are less sensitive to changes and less weight is attributed to these sites.

Table 7 shows the coordinates and release height of each point source (the flues each servicing a generator). The stack is location within the site as shown in Figure 10.

Table 7: Point Source Locations and Heights

Source	X (m)	Y (m)	Height (m)
Flue	413841.8	433348.2	11

Figure 10: Point Source Location (red circle)

Following the Environment Agency (EA) guidance on assessing impacts of air emissions, as a first step, the assessment has considered the predicted process contributions (PCs) using the following criteria:

- is the long-term (annual mean) PC less than 1% of the long-term AQAL; and
- is the short-term (24-hour mean or shorter) PC of the assessed percentile less than 10% of the short-term AQAL?

These screening criteria are initially applied to the maximum predicted value across the study area regardless of the presence of relevant receptors. Where both criteria are met, then the impacts can be screened out as being not significant. Where impacts are not screened out, the area of potential impact is considered with regard to the presence of receptors relevant for the averaging periods of the AQALs.

The human health and ecological impacts of all pollutants released from the facility have been demonstrated to be screened out based on the PCs being insignificant.

Since impacts can be screened out based on the PCs, there is therefore no requirement for the assessment to set out baseline conditions or PECs; no information of these has therefore been presented.

The assessment has shown that based on the modelled emission, there will be insignificant impacts on both human health receptors and ecological receptors from all pollutants considered.

D3 Secondary combustion temperature and residence time

Each combustion chamber should be equipped with at least one auxiliary burner. This burner shall be switched on automatically when the temperature of the combustion gases after the last injection of combustion air falls below the temperatures set out in paragraph 2. It shall also be used during plant start-up and shut-down operations in order to ensure that those temperatures are maintained at all times during these operations and as long as unburned waste is in the combustion chamber.

As the facility is a pyrolysis process, all syn-gases collected are cleaned prior to combustion in the gas burners. Prior to completion of the pyrolysis process, the chamber is heated up to 850 degrees Celsius for a minimum of 2 seconds.

The syn-gas combusted in the burners will reach a sufficient temperature to minimise emissions and ensure complete combustion where necessary.

D4 Energy recovery

The basic, low cost physical techniques that are incorporated into the plant include the following:

- Measures to minimises leakage/heat loss etc in the process - Insulation on all hot water pipe-work, vessels, boiler, combustion plant (high efficiency refractory insulation); High temperature insulation glass wool up to 1200 degree Celsius temperature
- High-efficiency electric motors for all drives;
- Provision of both forced draught (FD) and induced draught (ID) fans to ensure stable, efficient combustion conditions.

The facility will include the following features to improve energy recovery [what if any methods are being used, if any are then we need to set out the details]:

- Heat exchanges and steam turbine
- Flue-gas condensation
- Steam-water cycle optimisation
- Flue-gas recirculation
- Production of electricity

D5 Monitoring

Part 6 of Annex VI of the IED sets out the requirements for monitoring of emissions.

Monitoring will be carried out with equipment which meets the requirements set out in Part 6. All of the monitoring equipment associated with the emissions monitoring will be MCERTS-accredited and copies of the associated MCERTS certificates can be provided on request when reporting.

The following measurements relating to air polluting substances shall be carried out:

- continuous measurements of the following substances:
    - NOx,
    - CO,
    - total dust,
    - TOC,
    - HCl,
    - HF,
    - SO_2;
- continuous measurements of the following process operation parameters:
    - temperature near the inner wall or at another representative point of the combustion chamber as authorised by the competent authority,
    - concentration of oxygen,
    - pressure,
    - temperature
- continuous measurement of the water vapour content is not proposed as the sampled waste gas will be dried before the emissions are analysed. Should waste not be dried prior to emission analysis, measurements of the water vapour content will be recorded for the period of sampling.
- at least two measurements per year of heavy metals and dioxins and furans; one measurement at least every 3 months shall, however, be carried out for the first 12 months of operation.

The following measurements shall be carried out at the point of waste water discharge:

- continuous measurements of pH, temperature and flow;
- spot sample daily measurements of total suspended solids or measurements of a flow proportional representative sample over a period of 24 hours;
- at least monthly measurements of a flow proportional representative sample of the discharge over a period of 24 hours of Hg, Cd, Tl, As, Pb, Cr, Cu, Ni and Zn;
- at least every 6 months measurements of dioxins and furans; however, one measurement at least every 3 months shall be carried out for the first 12 months of operation.

Where the waste water from the cleaning of waste gases is treated on site collectively with other on-site sources of waste water, the operator shall take the measurements:

- on the waste water stream from the waste gas cleaning processes prior to its input into the collective waste water treatment plant;
- on the other waste water stream or streams prior to its or their input into the collective waste water treatment plant;
- at the point of final waste water discharge, after the treatment, from the waste incineration plant or waste co-incineration plant.

To enable compliance check monitoring to be undertaken, the chimney of the facility will be equipped with sample ports. The sample ports will be installed at a location in the chimney that is 5 x the flue diameter downstream of the nearest bend, and more than 2 diameters from the exit of the chimney. This is in accordance with the requirements of Environment Agency Technical Guidance Note M1 and British Standard BS-EN15259.

The location of the sample ports will ensure that a full traverse on both sampling planes can be achieved during the annual compliance monitoring programme.

If needed, temporary sampling platforms will be erected to enable full and unfettered access to the sample ports by the specialist contractors appointed to undertake the compliance monitoring programme.

D6 Prevention of operation in certain circumstances

Only a primary combustion chamber is used in the process, in the case of a failure the gas supply to the burners will be shut off and the system will turn off.

D6.1 Emergency Breakdown

Should there be a fault, the system will shut down by simple activation of the bypass switch.

All process gases will be bypassed into two safety procedures, first storing gas into holding tank, then feeding the remainder into the extra gas burner. These emergency steps can also be accessed by remote mobile.

Should the extra gas be feed into the gas burners, the gases will be combusted and emissions released from the exhaust flue after passing through the abatement and emission control system. No combustion gases will bypass the abatement controls. Should the extra gas be combusted in a backup flaring burner, the exhaust gases will still pass through the abatement and emission control system. No combustion gases will bypass the abatement controls.

D7 Minimisation of residues

The recovery process will only require Metals to be recycled.

The char (predominately carbon) is removed from the system, bagged within the building and then exported off site. It not stored on site.

D8 Disposal of residues

As above D7.

D9 Accidents and incidents

Accidents and incidents will be minimised and prevented through maintenance and training measures:

Accidents and incidents will be minimised and prevented through:

- Maintenance of all on-site equipment.
- By way of accident prevention, no waste will be burnt on site other than in plant specifically designed for the purpose and in accordance with the relevant statutory instruments,
- Smoking is not permitted on site.
- All personal will be trained and no unauthorised personnel will be allowed on site.
- Personally will use appropriate personal protective equipment (PPE).
- A full risk assessment will be carried out and regularly reassessed. A copy of the risk assessment will be available on-site at all times.

Where accidents and incidents occur, the following procedures are in place to address them and minimise any impact, see section 34E for details:

- all accidents and near misses will be reported internally;
- the facility will include various alarms and fail-safe systems to ensure optimum control in the event of an other than normal operating condition;
- further fire and accident prevention and management procedures are in the process of being prepared by The End Journey Ltd and will be implemented prior to operation of the SWIP;
- in the event of any operational failure of plant at the site, a senior manager will be contacted by operational staff. The manager will decide whether operations are to continue or be suspended prior to corrective action being taken. Serious operational failures, which result in the shutdown of the SWIP, will be recorded;

- in the event of any significant plant break-down or site emergency, the delivery of waste to site will be suspended where necessary to allow action to be taken safely, and to avoid a build-up of waste material being stored at the site;
- in the event of a fire occurring, the operator / site supervisor will exercise his judgement and extinguish the fire with a suitable fire extinguisher and / or call the fire service for assistance. A record will be made of any extra-ordinary events or incidents, including fires;
- in order to protect against potential pollution of the soil, surface water or ground water, the site includes comprehensive impermeable surfacing, both internally, and across the site yard; and
- spill kits and drain covers are available around the site for the management of incidents and the protection of local drains in the event of an emergency. The fall of the land across the site will direct any run-off into the roadway, and covering the drains will allow any water from fire-fighting to be collected and tankered away for appropriate treatment and disposal.

D10 Waste waters

Measures to minimise emissions to water during delivery and receipt of the waste are set out in section C2.2.3.

Precautions to be taken against the pollution of the soil, surface water or ground water during storage:

- Risk from rainwater is minimised as the process is carried out indoors and in the unusual case that waste material is stored on site it is stored under cover.

The pyrolysis plant itself is a sealed process. Any moisture produced in the process will be converted into steam to drive the system which is then condensed and recirculated through the process…no steam is released into the atmosphere. Fluid systems within the pyrolysis plant will be changed periodically and during change no water will be released into the local environment. The system uses an on-site Effluent Treatment Plant to clean the water used in the system.

Cleaning:

- The pyrolysis plant will be cleaned occasionally including the loading area to the reactor chamber.
- The hard surfaces and storage areas will be cleaned using water, there is no hazard material in the waste and therefore emissions are expected to be minimal.

Emergency water run-off (from firefighting), measures are in place with Yorkshire Water which are set out in the section on accidents and incidents (section D9).

E Management and training

E1 Competent persons

The site will be managed by The End Journey Ltd, who will ensure the facility is managed by competent personnel at all times.

Training of competent personnel will be carried out in line with the management of Health & Safety at Work regulations.

E1.1 Management

The duty manager will be responsible for ensuring the operation of the facility in accordance with all relevant regulations and the conditions of the permit.

E1.2 Training

Staff will be trained:

- on plant operation;
- will be taught permit compliance;
- health and safety regulations; and
- as well as emergency protocol.

E2 Environmental management systems (EMS)

E2.1 Introduction

An Environmental Management System (EMS) will be developed by The End Journey Ltd and implemented prior to the site commencing operation under the permit.

The key aspects of the EMS for the site will include:

- preventative maintenance;
- operator requirements;
- training and Competence;
- emergency response and incident management; and
- monitoring, measurement and reporting.

To meet the requirements of the SWIP, the “EMS” will be designed to ensure:

- identification of potential environmental impacts;
- prevention of any identified impacts;
- compliance assurance;
- identifications of risk from operation, pollution accidents; and
- activities at the site will be subject to continued review.

The EMS will be fully developed and implemented and in operation at the time of Plant Commissioning. A hard copy will be available on-site at all times. The company’s EMS will undergo periodic audit and review to ensure both compliance and continuous improvement is achieved.

The EMS will set out the following procedures.

Procedure	
Title	**Purpose**

Waste Pre-Acceptance	This procedure defines the screening, checking and pre-acceptance of all incoming waste prior to its arrival on site
Waste Acceptance	This procedure outlines the onsite controls and considerations that need to be applied when the waste materials arrive on site for processing
Waste Rejection	This procedure outlines the waste rejection process for all on-conforming wastes that cannot be processed on site. Acceptance of non-conforming wastes will be a direct breach of the permitted conditions of the sites Environmental permit
Off Site Waste Transfers	This procedure provides the necessary information to enable the assessment and off-site transfer of non-conforming or untreatable waste streams
Waste Reception and storage	This procedure outlines the waste reception, storage processes for all incoming waste
Environmental Records	This procedure defines the necessary Environmental Permit and Waste records that are required to be managed by the site to ensure compliance
Environmental Management and Monitoring Programme	This procedure provides an overview of all the necessary environmental monitoring procedures and controls to ensure compliance with the Permit
Infrastructure Management and Monitoring Programme	This procedure provides an outline of the inspection and cleaning requirements for the site
Accident Management Plan	This procedure refers to the site's emergency plans and response requirements

E2.1.1 Environmental Management System - Indicative Contents Page:

1 Document Control

1.1 Document Control Matrix

1.2 List of Procedures

2 Environmental Policy

2.1 Environmental Policy Statement

3 Environmental Risk

3.1 Environmental Impact Plan

3.2 Environmental Risk Assessment

4 Site Operations

4.1 Site Documents

4.1.1 Environmental Permit

4.1.2 Operating Techniques document or Working Plan (as applicable)

4.2 Operating Procedures

4.2.1 Waste Acceptance Procedure

4.2.3 Waste Storage Procedure

4.2.4 Waste Treatment Procedures

4.2.5 Plant Operating Procedure

10.1 Legislation Register

E2.2 The schedule of maintenance covering all plant and equipment at the installation

The detailed management system operated by the site will include procedures for ensuring that adequate maintenance is undertaken at the site.

The maintenance programme will ensure that all equipment or infrastructure that is deemed essential in the prevention of pollution to the environment (e.g. hard-standing, of abatement plant, etc.) or the prevention of pollution of local nuisance impacts is maintained and kept in good operating condition.

E2.2.1 Operator Competence

The facility will be fully automated to the point that all process activities will be monitored. The facility will have online monitoring which can be administered remotely to ensure the process is optimised and operating correctly.

Notwithstanding the above, the site will be fully staffed during all operations.

The primary role of the day staff is to ensure and oversee plant loading operations, fuel transfers and management.

Additional activities will include general site housekeeping. Additional staff attending the site will be visiting engineers from the equipment manufacturers who are adequately trained to perform their duties at the site. The site will maintain written operation instructions for all the plant and monitoring equipment present on site.

All personnel working at the facility will be trained in the necessary sections of the EMS and all associated procedures.

All staff working for and on behalf of the site, will be suitable trained and competent (e.g. professional maintenance engineers, electricians, equipment operators etc)

All operations on site will be managed by the Site Manager, who will act as both the competent person at the facility and the main process Supervisor.

Technical competence will be in accordance with the Chartered Institution of Wastes Management (CIWM) scheme. The Site Manager will obtain an Environmental Permitting Operators Certificate (EPOC) from CIWM which demonstrates an operator competence to manage a permitted waste and resources facility for low risk tier sites.

The site will operate in accordance with corporate standards and procedures in line with Local Authority and IED guidelines.

E2.2.2 Site Maintenance

The key aspects of the maintenance management programme will include:

- A Programme of the Planned Preventative Maintenance (PPM) is undertaken to ensure ongoing management and replacement of key plant and equipment rather than waiting for the equipment to fail and the maintenance of any critical environmental equipment
- The inspection and maintenance schedules that the manufacturer recommends are adhered to, including any period of recommended shut-down
- Real time data collection and plant condition monitoring

The EMS will include a requirement for a fortnightly shutdown and cleaning of the process.

The following is a checklist for maintenance and cleaning instruction

1. Visual inspection for blockages on distance pipe and pipework
2. Check fluid levels on Installation Tank
3. Control System Operating Panel displays are functioning correctly
4. Inspect operation of valves
5. Check fluid levels on Gas Separator tank
6. Main feeding door is operational (Opening and closing correctly)
7. Operational Inspection of the Water Scrubber tank
8. Check Gearbox fluid levels
9. Lubricate all moving parts
10. Inspect all tanks and chamber

E2.2.3 Monitoring and Reporting:

All records will be maintained as hard copies on site. Copies will also be electronically stored and where necessary submitted to the relevant authority.

Emission monitoring will be carried out in accordance with Section D5.

E2.3 Record keeping systems

E2.3.1 The acceptance of waste

The following is an example of the maintenance record sheet.

Receipt of waste						
Delivery number	Inspected	Passed	Fault Found	Checked By	Date & Time	Reported

E2.3.2 Maintenance

The following is an example of the maintenance record sheet.

Schedule of Maintenance						
Maintenance Inspection	Inspected	Passed	Fault Found	Checked By	Date & Time	Reported
1.Distance Pipe						
2.Installation Tank & Levels						
3.Control System Operating Panels						
4.Valves						
5.Gas separator tank & levels						
6.Door						
7.Water Scrubber Tank						

8.Gear Box						
9.System Grease						
10.Inspect Chamber						

The following is an example of the abatement control system maintenance record sheet.

Schedule of Maintenance - abatement control						
Abatement control	**Inspected**	**Passed**	**Fault Found**	**Checked By**	**Date & Time**	**Reported**
Odour abatement system						
Dust and particulate matter abatement system						
Acid gas abatement system						
NOx abatement system						
Metals abatement system						
Organic carbon abatement system						
Greenhouse gas abatement system						
Noise abatement system						

E2.3.3 Emission monitoring

Emissions monitoring will be carried out by a competent external 3rd party who will provide the emissions reports in the appropriate format for submission to the regulatory authority. As such no example for is provided here.

E2.3.4 Training

The following is an example of the training record sheet.

Personnel - training	Name: XXXX		
Training	**Passed**	**Trained By**	**Date & Time**
Health and Safety			
Operation of plant			
Emergency procedure			

E2.4 Compliance and responsibility training

E2.4.1 Staff Training & Duties/Compliance with Permit:

Operator Competence

All site operations will be governed by site manager as the competent person (with the relevant competent technical certificate).

Staff

All staff will be trained in accordance with EMS

All staff working on site will be suitably trained and competent (e.g.; Maintenance Engineers, Electricians, Equipment Operators).

E2.4.2 Site Security

The site will be kept secure within Internal Company procedures Perimeter fence will have a daily inspection. Main access gate to remain closed unless access is required. Site to be manned at all times of operation

E2.4.3 Accidents and Emergencies

The End Journey Ltd will develop its own Accident Management Plan based around the specific risks associated with the site operations.

The Key aspects of the Sites Accident Management plan are:

- Emergency Shutdown procedures
- Actions in case of fire/explosion
- Actions in case of fire/emergencies
- Contaminated firewater
- Failure of any equipment
- Spillages and uncontrolled releases
- Plant or equipment failure (e.g. over-pressure of vessels and pipework, blocked drains)
- The company will follow HSE guidelines of reporting and notifying the relevant body.
- Procedure to be held onsite to include emergency shut down of the plant.
- Incident reporting of unfamiliar noises from plant or loss of fluids or any description of plant failure
- All to be notified on site, logged and forwarded to the site operator

E2.4.4 Incident Reporting

The reporting of incidents and non-conformities will form a key component of the companies Environmental Management System. Identified non-conformities under the system include (but are not limited to) the following;

- Uncontrolled leaks and spillages of any materials with the potential to cause pollution to the environment (hydraulic fluids/oils, unabated dust emissions to the atmosphere)
- Non-compliance to any permitted condition or consent limit (emissions excursions, missing of reporting deadlines, breach of any permitted consent limits)
- Internal Audit findings
- External and Internal Complaints
- Whenever a plant malfunction, breakdown or failure, or any near miss occur
- The company will follow HSE guidelines of reporting and notifying the relevant body.
- Procedure to be held onsite to include emergency shut down of the plant.
- Incident reporting of unfamiliar noises from plant or loss of fluids or any description of plant failure
- All to be notified on site, logged and forwarded to the site operator

The EMS requires that all identified incidents and nonconformities will be investigated and closed out.

E2.5 Process for notification of relevant bodies in the event of an incident or abnormal emission

Operator will work off the Internal procedure:

- Immediately shut down the plant
- Inspect the plant
- Take the relevant steps to notify the Environmental Health Department