Determination of an Application for an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2016

Decision document recording our decision-making process

The Permit Number is:	EPR/NP3900MP
The Applicant / Operator is:	Wastefront Sunderland Limited
The Installation is located at:	Sunderland UTR facility Port of Sunderland

What this document is about

This is a decision document, which accompanies a permit.

It explains how we have considered the Applicant's Application, and why we have included the specific conditions in the permit we are issuing to the Applicant. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our position. Unless the document explains otherwise, we have accepted the Applicant's proposals.

We try to explain our decision as accurately, comprehensively and plainly as possible. Achieving all three objectives is not always easy, and we would welcome any feedback as to how we might improve our decision documents in future. A lot of technical terms and acronyms are inevitable in a document of this nature: we provide a glossary of acronyms near the front of the document, for ease of reference.

Preliminary information and use of terms

We gave the application the reference number EPR/NP3900MP/A001. We refer to the application as "the **Application**" in this document in order to be consistent.

The number we have given to the permit is EPR/NP3900MP. We refer to the permit as "the **Permit**" in this document.

The Application was duly made on 12 August 2022.

The Applicant is Wastefront Sunderland Limited, and we refer to them as "the **Applicant**" in this document. Where we are talking about what would happen after the Permit is granted, we call Wastefront Sunderland Limited "the **Operator**".

Wastefront Sunderland Limited proposed facility is located at Extension Road, East End, Port of Sunderland, SR1 2NR. We refer to this as “the **Installation**” in this document.

How this document is structured

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Glossary of acronyms used in this document

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

AAD	Ambient Air Directive (2008/50/EC)
APC	Air Pollution Control
AQS	Air Quality Strategy
BAT	Best Available Technique(s)
BAT AEL	BAT Associated Emission Level
CEM	Continuous emissions monitor
COMEAP	Committee on the Medical Effects of Air Pollutants
CV	Calorific value
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DD	Decision document
EAL	Environmental assessment level
EIAD	Environmental Impact Assessment Directive (85/337/EEC)
ELV	Emission limit value
EMAS	EU Eco Management and Audit Scheme
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154) as amended
ES	Environmental standard
EWC	European waste catalogue
FGC	Flue gas cleaning
FPP	Fire Prevention Plan
FSA	Food Standards Agency
GWP	Global Warming Potential
HHRAP	Human Health Risk Assessment Protocol
IED	Industrial Emissions Directive (2010/75/EU)
IPPCD	Integrated Pollution Prevention and Control Directive (2008/1/EC) – now superseded by IED
I-TEF	Toxic Equivalent Factors set out in Annex VI Part 2 of IED
I-TEQ	Toxic Equivalent Quotient calculated using I-TEF
LOI	Loss on Ignition
NIA	Noise Impact Assessment

NOx	Oxides of nitrogen (NO plus NO_2 expressed as NO_2)
PAH	Polycyclic aromatic hydrocarbons
PC	Process Contribution
PCB	Polychlorinated biphenyls
PEC	Predicted Environmental Concentration
PHE	Public Health England
POP(s)	Persistent organic pollutant(s)
PPS	Public participation statement
PXDD	Poly-halogenated di-benzo-p-dioxins
PXB	Poly-halogenated biphenyls
PXDF	Poly-halogenated di-benzo furans
RGS	Regulatory Guidance Series
SAC	Special Area of Conservation
SCR	Selective catalytic reduction
SGN	Sector guidance note
SNCR	Selective non-catalytic reduction
SPA(s)	Special Protection Area(s)
SSSI(s)	Site(s) of Special Scientific Interest
TDI	Tolerable daily intake
TEF	Toxic Equivalent Factors
TGN	Technical guidance note
TOC	Total Organic Carbon
UK HSA	UK Health Security Agency (formerly Public Health England (PHE) and Health Protection Agency (HPA))
US EPA	United States Environmental Protection Agency
WFD	Waste Framework Directive (2008/98/EC)
WHO	World Health Organisation
WID	Waste Incineration Directive (2000/76/EC) – now superseded by IED

1 Our decision

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

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

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

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

2 How we reached our decision

2.1 Receipt of Application

The Application was duly made on 12 August 2022. This means we considered it was in the correct form and contained sufficient information for us to begin our determination but not that it necessarily contained all the information we would need to complete that determination, see below.

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

2.2 Consultation on the Application

We carried out consultation on the Application and then again separately on revised and updated documents, in accordance with the EPR and our statutory PPS. We consider that this process satisfies, and frequently goes beyond the requirements of the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, which are directly incorporated into the IED, which applies to the Installation and the Application. We have also taken into account our obligations under the Local Democracy, Economic Development and Construction Act 2009 (particularly section 23). This requires us, where

we consider it appropriate, to take such steps as we consider appropriate to secure the involvement of representatives of interested persons in the exercise of our functions, by providing them with information, consulting them or involving them in any other way. In this case, our consultation already satisfies the Act's requirements.

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

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

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

- UK Health Security Agency (UK HSA)
- Director of Public Health
- Food Standards Agency (FSA)
- Marine consents
- Health & Safety Executive (HSE)
- Local authority
- Fire Safety
- Port of Sunderland

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

A summary of consultation comments and our response to the representations we received can be found in Annex 4 of this document. We have taken all relevant representations into consideration in reaching our determination.

2.3 Requests for further Information

Although we were able to consider the Application duly made, we did in fact need more information in order to determine it and issued information notices and requests for information as set out below. A copy of each information notice/request and responses were placed on our public register.

Information notice/request	Response received
Request for information 1 sent 22 August 2022 Noise Impact Assessment	27 February 2023
	08 March 2023
	31 March 2023
Request for information 2 sent 30 August 2022 Site Condition Report	01 September 2022
Schedule 5 Notice request for information 3 sent 05 September 2022	17 January 2023
	18 January 2023
	20 January 2023
	24 February 2023
	03 April 2023
Schedule 5 Notice request for information 4 sent 13 September 2022 Air Quality Assessment	08 March 2023
	03 April 2023
Further information provided Assessment of abatement options (Appendix BAT-OT 01)	28 February 2023
Request for information sent 06 June 2023 Back-up continuous emissions monitor query and inclusion of an additional European Waste Code	27 June 2023

3 The legal framework

The Permit will be granted under Regulation 13 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

- an *installation* and subject to Chapter IV of the IED;
- an *operation* covered by the WFD, and
- subject to aspects of other relevant legislation which also have to be addressed.

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

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

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

4 The Installation

4.1 Description of the Installation and related issues

4.1.1 The permitted activities

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

- Section 1.2 Part A(1)(f)(iv): Activities involving the pyrolysis, carbonisation, distillation, partial oxidation or other heat treatment of other carbonaceous material (otherwise than with a view to making charcoal).

Following our pre-application advice, the Applicant applied for an activity falling under Section 1.2 Part A(1)(f)(iv) of the EPR and we do not consider there is any need to reconsider that advice. The only other possible alternative activity would be under Section 5.1 for the incineration of waste. As the Installation can achieve the relevant BAT Associated Emission Levels (AELs) for Section 5.1, we have as part of our obligation to achieve a high level of protection for the environment, exercised our discretion to impose these, refer to section 6.5.1 of this document.

The primary purpose of the facility is the conversion of waste tyres into hydrocarbon fuels and carbon black.

Tyres are shredded with the removal of steel wire, before being fed into the pyrolysis reactors to produce gaseous and liquid phases and carbon-rich solid residues. The solid residue (char) is milled, pellitised and dried to produce carbon black. Hydrocarbon fuels are produced from distillation of the liquid phases for cracking/refining off-site.

Combustion of non-target residues takes place to provide heat and power for the facility. Fuel gas provides heat for the pyrolysers and combustion of the light distillate fraction in low-speed diesel engines generates power.

Although the process used to thermally treat the tyres is pyrolysis; for the process not to be subject to Chapter IV of the IED, the resultant gases from the pyrolysis must be purified to such an extent that they are no longer a waste prior to their combustion and can cause emissions no higher than those from the burning of natural gas. The Applicant has not demonstrated that the gases have passed the ‘end of waste’ test as referred to in the Waste Framework Directive (WFD); therefore the pyrolysis process is subject to the requirements of Chapter IV of the IED.

An Installation may also comprise “directly associated activities”, which at this Installation includes:

- Shredding and sorting of non-hazardous waste.
- Char processing by separation, milling and drying.
- Combustion of gases in a conventional flare in extreme emergency situations only.
- Receipt, storage and handling of waste and raw materials.
- Collection and drainage of uncontaminated surface water.
- Combustion of diesel and light distillate pyrolysis oil in low-speed diesel generators and combustion of natural gas and pyrolysis fuel gas in a fired heater.
- Product storage and shipment.

4.1.2 The Site

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

Further information on the site is addressed in section 4.2 of this document.

Feedstock reception
Waste tyres will be delivered as bales of whole tyres which will be stored in external bays, with a maximum pile size of 300m^3.

The tyre storage building is roofed and enclosed on three sides. The overall stockpile volume has been sized to provide 3-5 days processing capacity and to align with the requirements of our guidance on Fire Prevention Plans (FPPs).

From the main tyre storage area, bales will be transferred to interim storage adjacent to the shredding process building by forklift trick into two stockpiles. The maximum size of any stockpile in this area will be no greater than 300m^3.

Tyre shredding
Tyres are shredded with the removal of steel wire using magnetic separators.

The equipment is located in a soundproof enclosure, equipped with a dust extraction and removal system comprising a bag filter and extraction fan. Approximately 50 kg/h of dust, predominantly comprising fabric and rubber, is produced between the two lines which is collected in drums and stored in the main bale storage area pending transfer off-site for treatment or disposal at an appropriately regulated facility.

Pyrolysis

There are three pyrolysis lines located in an enclosed building, each consisting of four reactors, designed to operate at a capacity of 20,000 tonnes per year of tyre chips on a continuous basis. The reactors break down the tyre chips into a hydrocarbon vapour and a solid char which comprises carbon black, amorphous carbon, inorganic fillers and residual steel.

Pyrolysis reactor

The reactor is heated by an external jacket through which a combination of exhaust gas from the burning of fuel gas (produced by burning the process gas from the gas holder and distillation stage) and hot recycled exhaust gases from the heat recovery fan is fed. During start-up, the fuel gas can be supplemented by natural gas, however in normal steady operation there is a slight surplus of fuel gas.

Cooling and separation

The vapour phase extracted from the reactor passes to the oil cooling assembly, which uses a series of water-cooled heat exchangers to condense liquids from the vapours. The liquids collect in a horizontal drum (which is an integral part of the oil cooling and separating assembly) and are transported to the distillation stage using the oil transfer pump. The uncondensed vapours pass to the gas treatment stage for cleaning.

Char removal

Each reactor has a water-cooled screw conveyor sealed with the reactor, which removes and cools the char from the pyrolyser. The char is then transferred into a water-cooled elevator for further cooling before the solids are deposited on to an output conveyor for further processing in the recovered Carbon Black (rCB) area.

Fine steel is removed at this point and collected into a bin for baling and recycling off-site. The steel-free char is stored in an enclosed transition silo within the pyrolysis process area before being delivered for milling by a bucket elevator. Dust extraction from the conveying and steel removal activities is carried out with induced air flow fan and cleaned in a fabric filter, The fine dust is removed from the bottom of the filter through an airlock and collected into drums before being re-introduced to the char milling process or transferred off site for treatment or disposal.

Char processing/carbon black production

The solid residue (char) is milled, pellitised and dried to produce carbon black.

The pellets proceed to a fluidised bed dryer, which is fed with air heated from the combustion of pyrolyser gas in a fired heater. Air leaving the dryer passes through a filter unit to remove fines, which are collected in drums before being recirculated back through the pellitisation process and is then fed to the regenerative thermal oxidiser to ensure any trace hydrocarbons, carbon monoxide or other contaminants are destroyed.

Treatment of gaseous phase and process uses

The gas fraction from each of the three pyrolysis trains is scrubbed with a caustic solution operating at a high pH to remove hydrogen sulphide and any hydrogen chloride which may be present due to chlorine compounds in the rubber.

The vapours pass through a separator to remove liquid before being driven by a full pressure fan through a water seal tank and into the fuel gas holder.

Fuel gas is delivered from the holder to a pressure maintaining buffer tank which ensures that gas is delivered at uniform pressure for the various process uses.

The fuel gas splits into four streams:

- two streams fuel the burners for the carbon black pellet dryers;
- one stream is blended with fuel gas from distillation and is used as fuel for pyrolysis;
- the fourth stream comprises any surplus gas which is combusted in the regenerative thermal oxidiser (RTO).

Processing of the liquid phase

The liquid fraction (pyrolysis oil) undergoes a distillation process to separate it into end products. The distillation phase consists of three columns:

- naphtha separation column;
- light-heavy distillate column; and
- naphtha stabilisation column.

These separate the pyrolysis oil into four separate streams:

- naphtha;
- light distillate;
- optional heavy distillate; and
- fuel oil.

For some of the operational scenarios, heavy distillate product will not be produced, but the bottom product will consist of a blend of heavy distillate and fuel oil.

The naphtha stream has a stringent requirement on flash point and is stripped producing a significant gas stream. Some of this is used to fuel the pyrolysis process and the excess is treated in the RTO.

The liquid products from distillation are stored before transport off-site by road or barge.

The light distillate pyrolysis oil is all used on site as fuel for low-speed diesel engine generators (it is not suitable for use in conventional high speed diesel engines due to poor ignition properties).

Distillation

The distillation system consists of three towers. The first operates at slightly above atmospheric pressure (nominally atmospheric), the second operates under vacuum and has a surface condenser (which condenses the bulk of the hydrocarbons for reflux), followed by a mechanical vacuum pump - so does not create waste-water. It should be noted that the feed to the vacuum tower has very little light material (as the light material was removed in the first tower).

The third tower is a naphtha stripper that also works at approximately atmospheric pressure and which uses nitrogen to strip light materials.

The two atmospheric pressure towers ultimately discharge their uncondensed lights to the fuel gas system.

Water from the distillation process will be sent to the blow-down treatment system. Cascading caustic solution will be utilised in the blow-down treatment stage, with wastes sent off-site for treatment.

Emissions to air are reduced by condensing and subcooling in the light distillate condenser and returning it to the column as reflux.

Regenerative thermal oxidiser

The regenerative thermal oxidiser (RTO) is located in the Unit 4 Gas Treatment building and is used to treat the exhaust gases from the low-speed diesel engines, pyrolysers and rCB driers, as well as to burn any excess pyrolysis fuel gas and pyrolysis distillate if required.

The combustion chamber residence time is designed to achieve destruction of unburned hydrocarbons, trace chlorohydrocarbons, sulphur compounds, carbon monoxide and trace amounts of dioxins that may be present in the exhaust streams. In addition, the RTO completely combusts the surplus fuel gas.

Combustion exhaust gas quench and scrubbing

At this stage it would be possible to recover additional heat to a secondary hot oil circuit (sharing the same infrastructure as the hot oil exchanger upstream of the RTO but producing hot oil at a lower temperature for duties that do not require high temperature such as in distillation, which is the limiting case that set the hot oil temperatures). Alternatively, if the possibility of an external user of heat were to materialise in the future, this location is the ideal one from which to extract process heat. Currently, however there is no such requirement for the available heat and consequently the heat is discarded using a quench tower.

The cooled exhaust gases are transferred to the scrubber tower where acid gases are removed by a recirculating caustic solution. The cleaned exhaust gas is discharged to atmosphere via the 30m stack release point A1.

The scrubber solution is cooled and recirculated, with a continuous blow down and dosing with 40% caustic solution and make-up water to keep the total dissolved solids concentration in the desired design range (nominally 5%). Blow-down is transferred for treatment and water recovery.

Blow-down treatment

The blow-down streams from the pyrolysis scrubber and RTO exhaust scrubber are blended and fed to the blow-down stripper column. Water vapour leaves the top of the column and is condensed using air in the blow-down stripper condenser. The two-phase mixture from the condenser is separated into liquid and vapour fractions in the blow-down stripper vessel and the vapour goes overhead to a water-cooled condenser where additional water is recovered back to the stripper vessel. The incondensable vapours are sent to the RTO for destruction and the recovered water is sent back for use as quench and for scrubbing.

The liquid from the stripper column is circulated through the blow-down stripper reboiler and back to the tower. A side stream of concentrated salts (40% solids, 60% liquids) is removed for off-site disposal.

The spent caustic solution concentrate is collected in a tank of 50m^3 capacity which provides approximately two weeks production capacity at the normal rate of 180 kg/h.

The waste concentrate will be removed weekly by a qualified waste management company in road tankers for treatment at an appropriately regulated facility.

Fuels and fuel systems

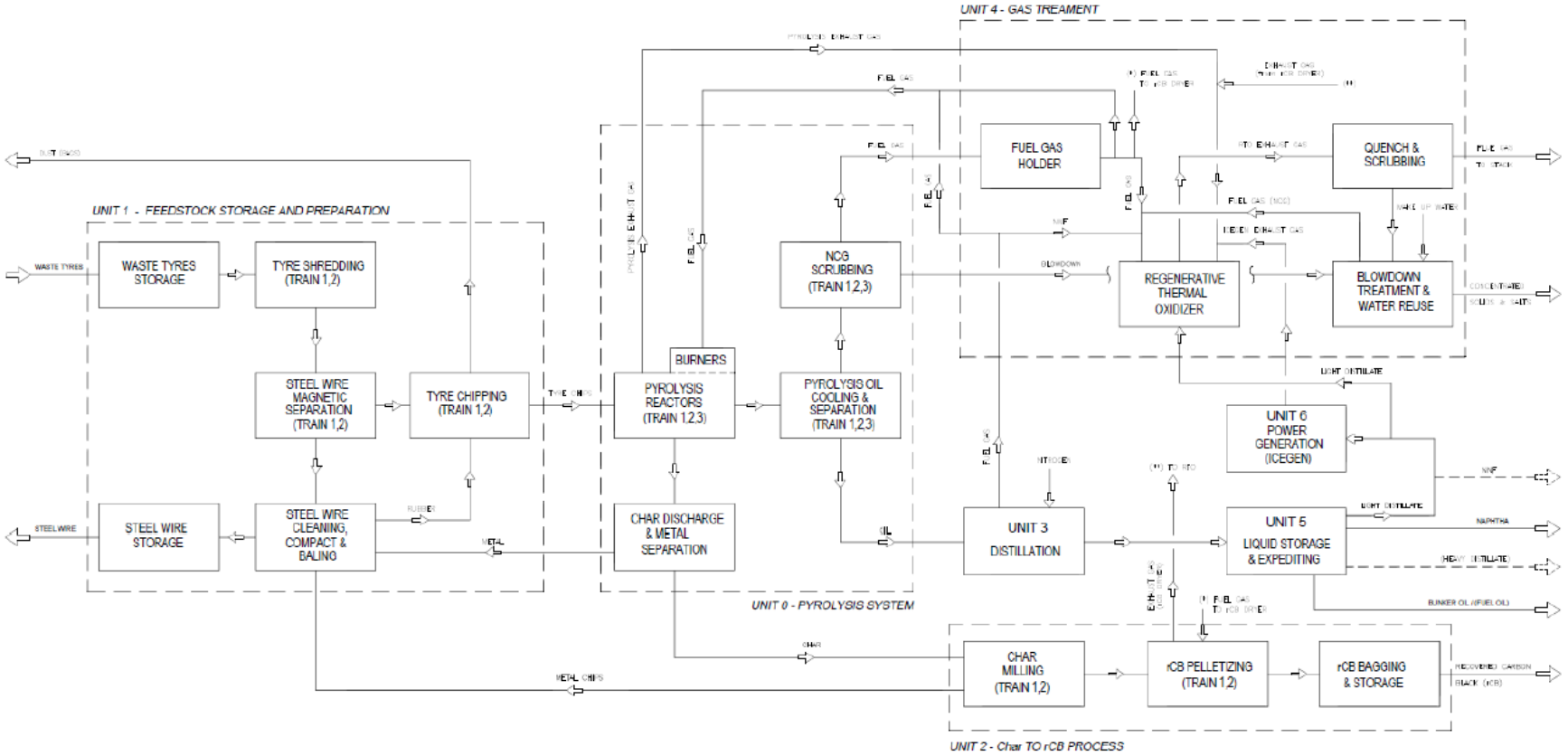
In common with processes described in the Refining of Mineral Oil & Gas Bref, the fuel used for the production of power and process heating at the facility originates from the fuels produced by the process itself, supplemented by imported natural gas.

Pyrolysis gas produced by the process will be burned in the RTO and pyrolyser burners to provide the process heating requirements.
Light distillate pyrolysis oil produced by the process will be burned in the diesel generators to provide power for the process.

Flare

The Operator confirmed that the flare unit to be installed will be of the correct design and size for the site. It will only be used for safety reasons during emergencies or maintenance work, and it is anticipated that it will be used less than 100 hours/year.

It was also confirmed that whilst the flare system had not been designed or procured; it would be an enclosed system complying with the BAT set out in our guidance at Onshore oil and gas sector guidance - 8. Flares at onshore oil and gas sites - Guidance - GOV.UK (www.gov.uk). We have included a pre-operational condition to address this deficiency.


UNIT 4 - GAS TREAMENT
UNIT 1 - FEEDSTOCK STORAGE AND PREPARATION
WASTE TYRES
WASTE TYRES STORAGE
TYRE SHREDDING (TRAIN 1,2)
STEEL WIRE MAGNETIC SEPARATION (TRAIN 1,2)
TYRE CHIPPING (TRAIN 1,2)
STEEL WIRE
STEEL WIRE STORAGE
STEEL WIRE CLEANING, COMPACT & BALING
BURNERS
PYROLYSIS REACTORS (TRAIN 1,2,3)
CHAR DISCHARGE & METAL SEPARATION
NCG SCRUBBING (TRAIN 1,2,3)
PYROLYSIS OIL COOLING & SEPARATION (TRAIN 1,2,3)
UNIT 0 - PYROLYSIS SYSTEM
FUEL GAS HOLDER
QUENCH & SCRUBBING
REGENERATIVE THERMAL OXIDIZER
BLOWDOWN TREATMENT & WATER REUSE
UNIT 6 POWER GENERATION (ICEGEN)
UNIT 3 DISTILLATION
UNIT 5 LIQUID STORAGE & EXPEDITING
CHAR MILLING (TRAIN 1,2)
rCB PELLETIZING (TRAIN 1,2)
rCB BAGGING & STORAGE
UNIT 2 - Char TO rCB PROCESS

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

Waste throughput,	77,000 tonnes/annum	
Waste processed	EWC 16 01 03 - End-of-life tyres EWC 19-12-04 to allow acceptance of those wastes where the producers generate shredded or granulated end-of-life 'treated' waste tyres	
Number of lines	3	
Furnace technology	Pyrolysis	
Auxiliary Fuel	Natural Gas	
Acid gas abatement	Wet	Caustic
Reagent consumption	Caustic 450 te/annum Process water: 21 m^3/hour	
Flue gas recirculation	Yes (use of the RTO to treat the recirculated exhaust gases)	
Stack	441363, 556875	
	Height, 30 m	Diameter, 0.97 m
Flue gas	Flow, 8.53 Nm^3/s	Velocity, 15 m/s
	Temperature 73 °C	

4.1.4 Key Issues in the Determination

The key issues arising during this determination were the impact from emissions to air and we therefore describe how we determined these issues in most detail in this document.

4.2 The site and its protection

4.2.1 Proposed site design: potentially polluting substances and prevention measures

All waste will be stored externally on engineered impermeable concrete surfacing, with kerbing in place.

All processing of solid materials will take place under cover or within buildings. The site benefits from impermeable concrete surfacing and a sealed drainage system. The site includes a surface containment area specifically to retain any spillages or contaminated surface water on site.

Tyre material will be handled with care at all times to avoid spillage during delivery to hoppers. Bales will be unloaded and delivered directly to the designated external storage bays by forklift, to reduce the amount of forklift travel required. External storage bays are near the site entrance.

The Applicant confirmed that storage tanks will be constructed in accordance with HSG 176 and CIRIA 736 guidance. Liquid storage tanks will be bunded or double skinned. The tank inventory was provided in Table 7-1 of the BAT OT document. The bunds will have the capability of containing at least 110% of the volume of the largest tank within the bund or 25% of the total tank volume within the bund, whichever is greater. Connection points will be located within the bunds. Any rainwater within the bunds will be pumped through an oil interceptor to drain.

Product storage tanks will have fixed roofs with a nitrogen blanket and carbon filters on the vents.

Naphtha will be stored initially in a 200 m^3 fixed-roof tank located adjacent to the distillation area. There will also be a 1,200 m^3 tank in the product storage area in the south-western part of the site. The intention of the 1,200 m^3 storage tank is to supply naphtha in sufficient quantity to be shipped by barge. It should be noted however that it takes approximately three months to fill the tank, thus reducing the number of transfers to the barge.

Light distillate will be stored in a 200 m^3 fixed roof tank located adjacent to the distillation area and is pumped to the low-speed diesel engines for power generation only, in the current design. However, the infrastructure exists to export light distillate by means of a loading arm should the opportunity for sale arise. It can also be sent to the RTO as support fuel or sent to the off-spec/rework tank, to be distilled again. The light distillate contains a range of compounds which would cause difficulty for use and marketing as a

conventional fuel blend stock. It has a high sulphur content, may contain trace amounts of chloroparaffins, contains a large fraction of aromatics and olefins and thus has a poor Cetane number. Finally due to the high olefins content, the material is not stable in storage.

Heavy distillate will be stored in a 200 m^3 fixed roof tank located adjacent to the distillation area. As for naphtha, certified material is pumped to a 1,200 m^3 storage tank, a volume which is sufficient for shipping by barge. The heavy distillate is pumped to the loading arm for transfer to trucks or barges or directing back to the process for rework. The heavy distillate tank is fitted with a heating coil and is also able to receive bunker oil, which provides additional bunker oil storage in cases when only three products are produced.

The bunker oil (or heavy fuel oil) will be stored in a 200 m^3 heated tank located adjacent to the distillation area before being pumped to the 4,000 m^3 bunker oil tank. The material can also be sent to the heavy distillate tank (see above). The bunker oil tank is fitted with a hot oil coil which may be used to maintain the material at an optimally pumpable temperature and is pumped to the loading area for dispatch by tanker or barge.

Off specification materials from processing will be collected in the off-spec and buffer tank. The material will be transferred either as a bleed-in to the distillation system, to the pyrolysis feed tank or loaded onto trucks for dispatch for treatment at an appropriately regulated facility.

The storage tanks will be located in the south-western part of the site as shown in Drawing 002 provided with the Application. They will be provided with nitrogen blankets with vent gases discharged locally, with the exception of bunker and fuel oil tanks. These tanks will have vents fitted with carbon filters to remove hydrocarbons.

Some of the tank volumes in section 4.11 (Product Storage) of the Best Available Techniques & Operating Techniques (BAT & OT) document dated January 2023 are not consistent with those listed in Table 7-1 (Tank Inventory). We have set a pre-operational requiring submission of this information.

Drip trays/bunds/tanks will be inspected visually on a regular basis by the site staff to ensure the continued integrity and identify the requirement for any remedial action.

Minor spillages will be cleaned up immediately, using sand or proprietary absorbent to clean up liquids and placed in alternative containers. Materials suitable for absorbing and containing minor spillages will be maintained on site.

During operational hours, the site staff will undertake daily monitoring of the storage areas for evidence of spillage and leakage. If evidence of spillage is seen, the affected units will be removed and transferred to treatment facilities immediately.

In the event of a major spillage, immediate action will be taken to contain the spillage and prevent liquid from entering surface water drains and the unsurfaced ground. The spillage will be cleared immediately and placed in containers for off-site disposal and the Environment Agency will be notified.

The process effluent and surface water run-off from potentially contaminated external surfaces will be collected and transferred by road tanker for treatment at an appropriately regulated facility.

The Site Manager will be responsible for implementing risk management measures in accordance with the management system.

Based upon the information provided, pollution of land and water is considered unlikely to occur during day-to-day operations subject to adequate environmental management, pollution prevention controls, surface water management (including discharges), hardstanding and drainage system being implemented / incorporated within the development.

We have no concerns with regards to flood risk as the site is in a tidal area and is not within a flood zone. The facility is also some distance from the main body of the River Wear and in an enclosed dock. In addition, the Environmental Risk Assessment (ERA) included within the Application states that the flood zone attributed to the site does not take into consideration the flood defences present along the coastal boundary adjacent to the site. Based on this, the risks associated with flooding and subsequent pollution of land and water during these events were not considered significant. In addition, the risks associated with storm surges are mitigated based on extra capacity being available within the proposed drainage system to capture potentially contaminated waters generated as part of these events.

The Application refers to various mitigation measures which includes operational procedures, action plans, existing flood defences, concrete surfacing, and a drainage system (with includes bunded areas, interceptors, outfalls and gullies) to mitigate the risks of pollution to land and water from the proposed operations, including future storm surge / flooding events.

The plans provided with the Application did not include flood defences and the existing and proposed drainage systems. We have included a pre-operational condition in the Permit requesting this additional information.

We responded as consultee on the Planning Application to Sunderland City Council (their reference 21/01383/MW4). Our response (NA/2021/115482/01-L01) dated 03 August 2021, confirmed that we did not consider the facility to have an increased risk of on or off-site flooding. We also requested that the Local Planning Authority lists the flood risk assessment provided with the Planning Application, as an approved plan/document, to which the development must adhere.

No details of the proposed periodic monitoring required for an IED facility were provided. Periodic monitoring is required to be carried out at least once every five years for waters and once every ten years for soils based upon the IED. This is used as a guide only and is based upon a systematic appraisal of the risk of contamination being undertaken.

Based on a systematic appraisal of the risk of contamination whilst given the proximity to various sensitive land and water receptors to the proposed facility and the significant contaminative history of the site, we have increased the frequency of periodic monitoring of land and water to every two years for waters and every four years for soils.

We are satisfied that the appropriate measures will be in place to prevent pollution of ground and groundwater.

Under Article 22(2) of the IED the Applicant is required to provide a baseline report containing at least the information set out in paragraphs (a) and (b) of the Article before starting operation.

The Applicant has submitted a site condition report which includes a report on the baseline conditions as required by Article 22. We have reviewed that report and consider that it adequately describes the condition of the soil and groundwater prior to the start of operations.

The baseline report is an important reference document in the assessment of contamination that might arise during the operational lifetime of the installation and at cessation of activities at the installation.

4.2.3 Closure and decommissioning

Having considered the information submitted in the Application, we are satisfied that the appropriate measures will be in place for the closure and decommissioning of the Installation, as referred to in section 19.3 of the BAT & OT document dated January 2023. A pre-operational condition requires the Operator to have an Environmental Management System (EMS) in place before the Installation is operational, and this will include a site closure plan.

At the definitive cessation of activities, the Operator has to satisfy us that the necessary measures have been taken so that the site ceases to pose a risk to soil or groundwater, taking into accounts both the baseline conditions and the site's current or approved future use. To do this, the Operator will apply to us for surrender of the Permit, which we will not grant unless and until we are satisfied that these requirements have been met.

4.3 Operation of the Installation – general issues

4.3.1 Administrative issues

The Applicant is the sole Operator of the Installation.

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

4.3.2 Management

The Applicant has stated in the Application that they will implement an Environmental Management System (EMS) that will be certified under ISO14001. A pre-operational condition is included requiring the Operator to provide a summary of the EMS prior to commissioning of the plant and to make available for inspection all EMS documentation. The Environment Agency recognises that certification of the EMS cannot take place until the Installation is operational.

An improvement condition is included requiring the Operator to report progress towards gaining accreditation of its EMS.

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

4.3.3 Site security

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

4.3.4 Accident management

The Applicant has not submitted an Accident Management Plan. However, having considered the other information submitted in the Application, we are satisfied that appropriate measures will be in place to ensure that accidents that may cause pollution are prevented but that, if they should occur, their consequences are minimised. An Accident Management Plan will form part of the EMS and must be in place prior to commissioning as required by a pre-operational condition.

The Applicant submitted a Fire Prevention Plan (FPP).

Table 7-1 of the FPP provides information on the amounts of waste stored on site and their locations. The Applicant confirmed that as the detailed design of the site has not yet been agreed, certain information is not yet available and where this is the case, has been marked ‘tbc’ (to be confirmed). They confirm that the FPP will be updated once the information is available.

The Applicant also confirmed that the detection and suppression systems have not yet been designed and that they will be designed and installed in accordance with our guidance. They confirm that the FPP will be updated to include all details of these systems upon commissioning.

We have set a pre-operational for an updated FPP to be provided to address these deficiencies prior to commissioning.

4.3.5 Off-site conditions

We do not consider that any off-site conditions are necessary.

4.3.6 Operating techniques

We have specified that the Applicant must operate the Installation in accordance with the documents listed in table S1.2 of the Permit. These documents describe the techniques that will be used for the operation of the Installation that have been assessed by the Environment Agency as BAT. They form part of the Permit through Permit condition 2.3.1 and table S1.2 in the Permit Schedules.

Article 45(1) of the IED requires that the Permit must include a list of all types of waste which may be treated using at least the types of waste set out in the European Waste List established by Decision 2005/532/EC, EC, if possible, and containing information on the quantity of each type of waste, where appropriate.

The Application confirms that the only waste that will be accepted on site are end-of-life tyres, coded by the European Waste Catalogue (EWC) number 16 01 03.

They later confirmed that they would also require EWC number 19-12-04 to allow acceptance of those wastes where the producers generate shredded or granulated end-of-life ‘treated’ waste tyres.

The Applicant will accept these waste streams, with the plant capable of processing in an environmentally acceptable way. We have specified the permitted waste types, descriptions and quantities which can be accepted at the Installation in table S2.2 of the Permit.

We have limited the capacity of the Installation to 77,000 tonnes per annum. This is based on the Installation operating 8,760 hours per year.

4.3.7 Energy efficiency

(i) Consideration of energy efficiency

The process has been designed to be as energy efficient as possible, using waste heat whenever possible, i.e. the pyrolyser is heated by waste exhaust gases and exhaust gases from pyrolysis.

(ii) Use of energy within the Installation

Having considered the information submitted in the Application, we are satisfied that appropriate measures will be in place to ensure that energy is used efficiently within the Installation.

The total power requirement for the process is estimated to be 3,577 kW. 3,300 kW of this will be generated on-site by the burning of light distillate pyrolysis oil from the pyrolysis process within 3 x 2.08 MWth generators. The remaining 277 kW requirement will be provided by the grid.

Approximately 5,600 tonnes per year of pyrolysis gas will be burned in the RTO to provide heat for the process.

Natural gas will be required for plant operations, which include pyrolyser and RTO start-up burners and the pilot for the emergency flare. Annual consumption is anticipated to be 981,120 Nm^3 per annum under normal operating conditions.

Energy Source	Annual Consumption
Light distillate oil for power generation	26,136 MWh
Power from grid	2,194MWh
Pyrolysis gas	5,600 tonnes
Natural gas from grid	981,120Nm^3

The Application details a number of measures that will be implemented at the Installation in order to increase its energy efficiency:

- Use of pyrolysis process gas/light distillate pyrolysis oil for process heating;
- Use of closed loop hot oil system for heating/cooling;
- Low energy light fittings will be used where practicable;
- High efficiency electrical drive motors;
- Use of variable speed drives for larger duties, where applicable; and

- Adiabatic cooling using multiple fans to minimise electricity consumption during cold weather

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

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

Heat from the combustion of pyrolysis fuel gas is recovered within the process.

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

Combustion Unit	Fuel	Thermal input	Remark
RTO	• Excess pyrolysis gas • Excess light distillate • Natural gas support	10126kW	Naphtha shall not be used as fuel
Pyrolyser fired heater	• Pyrolysis gas • Natural gas support	8725kW	The specified duty is requirement of 10 Pyrolysis reactors. Each Pyrolysis reactor has its dedicated heater.
3 x Diesel generators	• Light distillate + commercial biodiesel • Pyrolysis gas • Commercial Diesel (for start-up & shut down)	3 X 2080 kW	The fuel shall be combination of Pyrolysis Gas + Liquid fuel (mixture of light distillate & commercial biodiesel or only biodiesel)

Compliance with Article 14(5) of the Energy Efficiency Directive is not a relevant consideration because the Installation's total net thermal input is 14.97 MWth which is below the 20 MWth threshold specified in the directive.

The 10.126 MWth for the RTO is not included in the aggregated net thermal input as its primary purpose is abatement.

(v) Permit conditions concerning energy efficiency

The Operator is required to report energy usage under condition 4.2 and Schedule 4 of the Permit. The following parameters are required to be reported against tonnes of tyres pyrolysed:

- Natural gas usage;
- Installation produced light distillate oil used at the Installation for power generation; and
- Installation produced pyrolysis fuel gas used at the Installation.

We accept that the Applicant's proposals represent BAT for this Installation.

4.3.8 Efficient use of raw materials

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

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

This requirement addresses wastes produced at the Installation and does not apply to the waste being treated there. The principal waste streams the Installation will produce are dust from tyre shredding, steel wire cleaning and dedusting and oil filter cartridges.

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

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

5. Minimising the Installation's environmental impact

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

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

The next sections of this document explain how we have approached the critical issue of assessing the likely impact of the emissions to air from the Installation on human health and the environment and what measures we are requiring to ensure a high level of protection.

5.1 Assessment Methodology

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

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

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

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

5.1.2 Use of Air Dispersion Modelling

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

Once short-term and long-term PCs have been calculated in this way, they are compared with Environmental Standards (ES). ES are described in our web guide 'Air emissions risk assessment for your environmental permit'.

PCs are screened out as **insignificant** if:

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

The **long-term** 1% PC insignificance threshold is based on the judgements that:

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

The **short-term** 10% PC insignificance threshold is based on the judgements that:

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

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

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

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

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

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

5.2 Assessment of Impact on Air Quality

The Applicant's assessment of the impact of air quality is set out in the following:

Updated Air Emissions Risk Assessment for normal operation (version 1.1, dated March 2023).

Updated Air Emissions Risk Assessment for abnormal operation (version 1.0, dated March 2023).

The assessments comprise:

- Dispersion modelling of emissions to air from the operation of the RTO discharged via the quench and wet scrubber at emission point A1, in combination with releases from the three dust filters at emission points A5, A6 and A7.
- A study of the impact of emissions on nearby sensitive sites, including habitat / conservation sites.

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

The Applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on local air quality from the Installation's stack emissions using the ADMS 5.2.0 dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model used five years of Numerical Weather Prediction (NWP) meteorological data for the grid square centred at the facility from 2016 to 2020.

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

- First, they assumed that the emission limit values (ELVs) in the Permit would be the maximum permitted by Article 15(3), Article 46(2) and Annex VI of the IED (except for metals).

  Former WID group 1 metals (see section 5.2.3 of this document), the aggregated ELV has been assumed to be cadmium (Cd).

  Former WID group 2 metals (see section 5.2.3 of this document), the aggregated ELV has been assumed to be mercury (Hg).

  Former WID group 3 comprises nine individual metals (see section 5.2.3 of this document) (antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni), and vanadium (V)).

  The substances with ELVs are:
  - Oxides of nitrogen (NO_x), expressed as NO_2
  - Total dust
  - Carbon monoxide (CO)
  - Sulphur dioxide (SO_2)
  - Hydrogen chloride (HCl)
  - Hydrogen fluoride (HF)

    - Metals (Cd, thallium (Tl) (former WID group 1), Hg (former WID group 2), Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V (former WID group 3)
    - Polychlorinated dibenzo-para-dioxins and polychlorinated dibenzo furans (referred to as dioxins and furans)
    - Gaseous and vaporous organic substances, expressed as Total Organic Carbon (TOC)

- Second, they assumed that the Installation operates continuously at the relevant long-term or short-term ELVs, i.e. the maximum permitted emission rate (except for emissions of metals, which are considered in section 5.2.3 of this decision document).
- Third, the model also considered emissions of pollutants not covered by Annex VI of the IED, specifically, polycyclic aromatic hydrocarbons (PAH) and Polychlorinated biphenyls (PCBs). Emission rates used in the modelling have been drawn from data in the Waste Incineration BREF and are considered further in section 5.2.2.

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

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

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

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

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

5.2.1 Assessment of Air Dispersion Modelling Outputs

The Applicant's modelling predictions are summarised below.

The Applicant's modelling predicted peak ground level exposure to pollutants in ambient air. We have conservatively assumed that the maximum concentrations occur at the location of receptors.

Whilst we have used the Applicant's modelling predictions in the table below, we have made our own simple verification calculation of the percentage PC

and predicted environmental concentration (PEC). These are the numbers shown in the tables below and so may be very slightly different to those shown in the Application. Any such minor discrepancies do not materially impact on our conclusions.

Pollutant	**ES**		**Back-ground**	**Process Contribution (PC)**		**Predicted Environmental Concentration (PEC)**	
	µg/m³	**Reference period**	**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
NO_2	40	Annual Mean	21.3	5.6	14.00	26.9	67.3
	200	99.79th %ile of 1-hour means	42.6	39.3	19.7	81.9	41.0
PM_{10}	40	Annual Mean	15	0.5	1.25	15.5	38.8
	50	90.41st %ile of 24-hour means	-	1.5	3.00	-	-
$PM_{2.5}$	20	Annual Mean	8	0.5	2.50	8.50	42.5
SO_2	266	99.9th %ile of 15-min means	3.9	34.6	13.0	38.5	14.5
	350	99.73rd %ile of 1-hour means	3.9	27.5	7.86	31.4	9.0
	125	99.18th %ile of 24-hour means	3.9	12.5	10.0	16.4	13.1
HCl	750	1-hour average	-	7.8	1.04	-	-
HF	16	Monthly average	-	0.1	0.63	-	-
	160	1-hour average	-	0.8	0.5	-	-
CO	10000	Maximum daily running 8-hour mean	-	27.0	0.27	-	-

	30000	1-hour average	-	39.1	0.13	-	-
TOC Note 1	2.25	Annual Mean	0.42	0.4	17.78	0.82	36.44
	30	Daily average	0.84	3	10.00	3.84	12.80
PAH Note 2	0.00025	Annual Mean	0.00015	0.00004	16.00	0.00019	76.0
	0.2	Annual Mean	-	0.0002	0.10	-	-
PCBs	6	1-hour average	-	0.004	0.07	-	-
Note 1: TOC as 1,3 butadiene for long-term and benzene for short-term. Note 2: PAH as benzo[a]pyrene.							

(i) Screening out emissions which are insignificant

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

- HCl, HF, CO and PCBs.

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

(ii) Emissions unlikely to give rise to significant pollution

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

- NO_2, PM_{10}, $PM_{2.5}$ (refer to section 5.2.2 of this document), SO_2, TOC and PAH.

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

(iii) Emissions requiring further assessment

For those emissions that do not screen out as insignificant, we consider they are unlikely to give rise to significant pollution.

5.2.2 Consideration of key pollutants

(i) Nitrogen dioxide (NO_2)

The impact on air quality from NO_2 emissions has been assessed against the ES of 40 $\mu g/m^3$ as a long-term annual average and a short-term hourly average of 200 $\mu g/m^3$. The model assumes a 70% NO_X to NO_2 conversion for the long-term and 35% for the short-term assessment in line with Environment Agency guidance on the use of air dispersion modelling. It is also based on worst case limits set by Annex VI of the IED and not the lower BAT AEL.

The assessment shows that the predicted peak long-term and short-term PCs are greater than 1% and 10% respectively of the ES and therefore cannot be screened out as insignificant. Even so, the emission is not expected to result in the ES being exceeded.

The Applicant is required to prevent, minimise and control NO_2 emissions using BAT, this is considered further in section 6 of this document. We are satisfied that NO_2 emissions will not result in significant pollution.

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

The impact on air quality from particulate emissions has been assessed against the ES for PM_{10} (particles of 10 microns and smaller) and $PM_{2.5}$ (particles of 2.5 microns and smaller). For PM_{10}, the ESs are a long-term annual average of 40 $\mu g/m^3$ and a short-term daily average of 50 $\mu g/m^3$. For $PM_{2.5}$ the ES of 20 $\mu g/m^3$ as a long-term annual average was used.

The assessment assumes that **all** particulate emissions are present as PM_{10} for the PM_{10} assessment and that **all** particulate emissions are present as $PM_{2.5}$ for the $PM_{2.5}$ assessment. It is also based on worst case limits set by Annex VI of the IED and not the lower BAT AEL.

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

- It assumes all particulates emitted are below either 10 microns (PM_{10}) or 2.5 microns ($PM_{2.5}$), when some are expected to be larger.

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

The assessment shows that the predicted peak long-term and short-term PCs for emissions of PM_{10} and $PM_{2.5}$ are greater than 1% and 10% respectively of the ES and so cannot be screened out as insignificant. However, the

assessment is based very much on a worst-case scenario. Even so, the emission is not expected to result in the ESs being exceeded.

The Applicant is required to prevent, minimise and control particulate emissions using BAT, this is considered further in section 6 of this document. We are satisfied that particulate emissions will not result in significant pollution.

(iii) Acid gases, HCl, HF and SO_2

Emissions of HCl and HF can be screened out as insignificant in that the predicted peak PCs are <10% of the short-term ES. There is no long-term ES for HCl.

HF has 2 assessment criteria – a 1-hr ES of 160 $\mu g/m^3$ and a monthly EAL of 16 $\mu g/m^3$ – the predicted peak PC is <1% of the monthly EAL and so the emission screens out as insignificant if the monthly ES is interpreted as representing a long-term ES.

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

Whilst SO_2 emissions cannot be screened out as insignificant, the emission is not expected to result in the ES being exceeded. This is based on worst case limits set by Annex VI of the IED and not the lower BAT AEL.

The Applicant is required to prevent, minimise and control SO_2 emissions using BAT, this is considered further in section 6 of this document. We are satisfied that SO_2 emissions will not result in significant pollution.

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

For CO and PCB emissions, the predicted peak long-term and short-term PCs are less than 1% and 10% respectively of the ESs and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

For VOC emissions, the peak long-term PC is greater than 1% of the ES and therefore cannot be screened out as insignificant. Even so, the emission is not expected to result in the ES being exceeded.

The Applicant has used the ES for benzene for their assessment of the impact of TOC. This is higher than that for 1,3 butadiene which has the lowest ES of organic species likely to be present in VOC (other than PAH, PCBs, dioxins and furans). The use of benzene is still reasonably precautionary and does not change any of the conclusions drawn.

For PAH emissions, the peak long-term PC is greater than 1% of the ES and therefore cannot be screened out as insignificant. Even so, the emission is not expected to result in the ES being exceeded.

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

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

Whilst all emissions cannot be screened out as insignificant, the Applicant's modelling shows that the Installation is unlikely to result in a breach of the ESs. The Applicant is required to prevent, minimise and control VOC and PAH emissions using BAT, this is considered further in section 6 of this document. We are satisfied that PAH and VOC emissions will not result in significant pollution.

(V) Summary

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

5.2.3 Assessment of Emission of Metals

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

There are three sets of BAT AELs for metal emissions (These are worst case limits set by Annex VI of the IED and not the lower BAT AELs):

- An emission limit value of 0.05 mg/m^3 for Hg and its compounds (formerly WID group 1 metals).
- An aggregate emission limit value of 0.05 mg/m^3 for Cd and Tl and their compounds (formerly WID group 2 metals).

- An aggregate emission limit of 0.5 mg/m^3 for Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (formerly WID group 3 metals).
- The Applicant has used analysis sponsored by the European Commission in 2004 which characterises the elemental metal content of tyre rubber at: (https://www.groundsmartrubbermulch.com/docs/resources/Measurement-of-non-exhaust-particulate-matter.pdf)
- This data represents a summary of several studies.
- The maximum compositional dataset for each metal (mg/kg) was applied in the assessment.
- The European Commission analysis literature review did not find data for speciated chromium to identify hexavalent chromium; similar studies on use of waste tyre rubber reached the same conclusions. However a review by the European Chemicals Agency found that:

  "*In one study Cr VI was specifically reported but the concentration was below LOD … (specified as <0.004 mg/kg)*."

  In the absence of other data this maximum value was adopted.

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

Pollutant	**ES**		**Back-ground**	**Process Contribution**		**Predicted Environmental Concentration**	
	ng/m^3	**Reference period**	**ng/m^3**	**ng/m^3**	**% of EAL**	**ng/m^3**	**% of EAL**
Cd	5	Annual mean	0.09	2	40.0	2.09	41.8
Tl							
Hg	250	Annual mean	-	2	0.80	-	-
	7500	1-hour average	-	39	0.52	-	-
Sb	5000	Annual mean	-	0.2	0.00	-	-
	150000	1-hour average	-	3.1	0.00	-	-
Pb	250	Annual mean	4.5	13	5.20	17.50	7.00
Co							

Cu	10000	Annual mean	-	2.3	0.02	-	-
	200000	1-hour average	-	46	0.02	-	-
Mn	150	Annual mean	-	0.2	0.13	-	-
	1500000	1-hour average	-	3.1	0.00	-	-
V	1000	24-hr average	-	0.60	0.06	-	-
As	6	Annual mean	0.33	0.06	1.00	0.39	6.5
Cr (II)(III)	5000	Annual mean	-	0.54	0.01	-	-
	150000	1-hour average	-	10.00	0.01	-	-
Cr (VI)	0.25	Annual mean	-	0.0004	0.16	-	-
Ni	20	Annual mean	0.47	4.00	20.00	4.47	22.4

The following emissions of metals were screened out as insignificant:

- Hg, Sb, Cu, Mn, V and Cr (II) (III) (VI).

The following emissions of metals whilst not screened out as insignificant were assessed as being unlikely to give rise to significant pollution:

- Cd, Pb, As and Ni.

We agree with the data used for the assessment.

We accept the Applicant's proposals are BAT relating to the environmentally insignificant emissions.

For Cd, Pb, As and Ni, emissions do not screen out as insignificant. Even so, the emission is not expected to result in the ES being exceeded.

The Applicant is required to prevent, minimise and control metal emissions using BAT, this is considered further in section 6 of this document. We are satisfied that metal emissions will not result in significant pollution.

5.2.4 Consideration of Local Factors

Impact on Air Quality Management Areas (AQMAs)

No Air Quality Management Areas (AQMAs) have been declared within an area likely to be affected by emissions from the Installation.

5.3 Human health risk assessment

5.3.1 Our role in preventing harm to human health

The Environment Agency has a statutory role to protect the environment and human health from all processes and activities it regulates. We assessed the effects on human health for this Application in the following ways:

i) Applying Statutory Controls

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

The main conditions in the Permit are based on the requirements of the IED. Specific conditions have been introduced to specifically ensure compliance with the requirements of Chapter IV. The aim of the IED is to prevent or, where that is not practicable, to reduce emissions to air, water and land and prevent the generation of waste, in order to achieve a high level of protection of the environment taken as a whole. IED achieves this aim by setting operational conditions, technical requirements and emission limit values to meet the requirements set out in Articles 11 and 18 of the IED. These requirements may in some circumstances dictate tighter emission limits and controls than those set out in Chapter IV of IED. The assessment of BAT for this Installation is detailed in section 6 of this document.

ii) Environmental Impact Assessment

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

iii) Health Risk Models

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

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

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

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

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

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

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

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

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

iv) Consultations

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

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

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

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

The results of the Applicant's assessment of dioxin intake are detailed in the table below. (worst-case results for each category are shown).

The hypothetical worst-case exposure pathway assumes that the most sensitive receptor is consuming vegetables grown and livestock reared at the point of maximum ground level impact (which occurs close to the site boundary to the east on the foreshore where there is no relevant exposure receptors).

The highest impact at a residential receptor on the mainland to the west of the facility represents worst-case actual exposure.

Receptor		Adult Note 1	Child Note 1
Max. ground level impact (hypothetical exposure)	Farmer	8.5×10^{-3}	1.2×10^{-2}
Max. impact in residential area (actual exposure)	Resident	1.1×10^{-6}	4.7×10^{-6}
Note 1: Calculated maximum daily intake of dioxins by local receptors resulting from the operation of the proposed facility (WHO-TEQ/ kg-BW/day)			

The results show that the predicted daily intake of dioxins, furans and dioxin like PCBs at all receptors, resulting from emissions from the proposed facility, were significantly below the recommended TDI levels ranging from 1.1% of the TDI for the hypothetical farmer child, to <0.1% of the TDI for the residents actual exposure.

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

5.4 Impact on Habitats sites and non-statutory conservation sites

5.4.1 Sites Considered

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

Durham Coast SAC
Northumbria Coast SPA
Northumbria Coast Ramsar

There are no Sites of Special Scientific Interest (SSSI) within the 2 Km screening distance of the Installation.

The following non-statutory local wildlife and conservation sites are located within the 2 Km screening distance of the Installation:

Hendon Railway
Mowbray Park
North Dock Tufa
Sunderland South Docks
Wearmouth Riverside Park/Wearmouth Colliery
Hendon Cliffs

The Applicant's assessment did not include Hendon Cliffs, located furthest from the facility at 1,909 metres. We have not required an assessment based on the results of the other non-statutory sites, where PCs are all significantly below the relevant critical level or critical load.

We have included the results of the assessment for Sunderland South Docks in section 5.4.3 of this document as this is the most impacted site, representing worst-case scenario.

5.4.2 Habitats Assessment

Durham Coast SAC, Northumbria Coast SPA/Ramsar

Pollutant	ES / EAL ($\mu g/m^3$)	Process Contribution (PC) ($\mu g/m^3$)	PC as % of ES
Direct Impacts Note 2			
NO_x Annual	30	0.1	0.33
NO_x Daily Mean	75	1.4	1.9
SO_2 Annual	10 Note 1	<0.1	<1.0
HF Weekly Mean	0.5	0.002	0.4
HF Daily Mean	5	0.01	0.2
Deposition Impacts Note 2			
N Deposition (kg N/ha/yr)	8	0.01	0.1
Acidification (Keq/ha/yr)	1.033	0.0036	0.3

Note 1: The lichen and bryophyte sensitivity standard for sulphur dioxide has been assigned for this assessment as a conservative approach.

Note 2: Direct impact units are $\mu g/m^3$ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

Emissions can be screened out as insignificant in that the maximum predicted PC at the SAC/SPA/Ramsar is < 1% of the long-term ESs and <10% of the short-term ESs.

The Applicant's Habitats assessment was reviewed by the Environment Agency's technical specialists for modelling, air quality, conservation and ecology technical services, who agreed with the assessment's conclusions, that there would be no likely significant effect on the interest features of the protected sites.

5.4.3 Assessment of other conservation sites

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

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

Critical levels and loads are set to protect the most vulnerable habitat types. Thresholds change in accordance with the levels of protection afforded by the legislation. Therefore the thresholds for SAC SPA and SSSI features are more stringent than those for other nature conservation sites.

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

Sunderland South Docks

Pollutant	ES / EAL ($\mu g/m^3$)	Process Contribution (PC) ($\mu g/m^3$)	PC as % of ES
Direct Impacts Note 2			
NO_x Annual	30	0.3	1.0
NO_x Daily Mean	75	3.7	4.9
SO_2 Annual	10 Note 1	0.1	1.0
HF Weekly Mean	0.5	0.006	1.2
HF Daily Mean	5	0.02	0.4
Deposition Impacts Note 2			
N Deposition (kg N/ha/yr)	15	0.027	0.18
Acidification (Keq/ha/yr) Note 3	2.366	0.0099	0.4

Note 1: The lichen and bryophyte sensitivity standard for sulphur dioxide has been assigned for this assessment as a conservative approach.

Note 2: Direct impact units are $\mu g/m^3$ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

Note 3: There was no comparable habitat with established critical load estimate available for Sunderland South Docks. We used the worst-case assessment for North Dock Tufa.

We are satisfied that the Applicant is using BAT to control emissions, refer to section 6 of this document.

We therefore conclude that the Installation is not causing significant pollution at these other sites as the PC is less than the relevant critical level or critical load.

5.5 Impact of abnormal operations

Annex VI co-incineration emission limit values (ELVs) apply to the combustion of syngas produced within the process. This means that Article 50(4)(c) of IED applies, requiring the facility to operate an automatic system to prevent tyre waste feed whenever any of the continuous emission monitors show that an ELV is exceeded due to disturbances or failures of the RTO. Notwithstanding this, Article 46(6) allows for the continued pyrolysis of waste tyres under such conditions provided that this period does not (in any circumstances) exceed 4 hours uninterrupted continuous operation or the cumulative period of operation does not exceed 60 hours in a calendar year. This is a recognition that the emissions during transient states (e.g. start-up and shut-down) are higher than during steady-state operation, and the overall environmental impact of continued operation with a limited exceedance of an ELV may be less than that of a partial shut-down and re-start.

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

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

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

In making an assessment of abnormal operations, emission concentrations released at A1 are from light distillate fuelled generators and those from A2 (emergency flare) are unabated pyrolysis gas by-passing the RTO and quench/scrubber. Particulate releases from A5 to A7 remain unchanged from normal operation.

The following worst-case scenario has been assumed for emission A2:

- NO_x emissions of 600 mg/m^3 (1.5 x normal)
- Particulate emissions of 150 mg/m^3 (5 x normal)
- SO_2 emissions of 500 mg/m^3 (3.33 x normal)
- CO emissions of 400 mg/m^3 (2 x normal)
- HCl emissions of 900 mg/m^3 (15 x normal)

- HF emissions of 10 mg/m^3 (2.5 x normal)
- TOC emissions of 100 mg/m^3 (5 x normal)
- Group 1 and group 2 metal emissions of 5 mg/m^3 (100 x normal)
- Group 3 metal emissions of 50 mg/m^3 (100 x normal)
- Dioxin emissions of 0.00001 mg/m^3 (10 ng/m^3) (100 x normal)
- PAH emissions of 0.1 mg/m^3 (100 x normal)
- PCBs 0.5 mg/m^3 (100 x normal)

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

(i) Screening out emissions which are insignificant

The emissions of the following substances can still be screened out as insignificant in that the PC is <10% of the short-term ES. These are:

- PM_{10}, CO, HF, former group 1 and 3 metals and PCBs.

(ii) Emissions unlikely to give rise to significant pollution

The following emissions (which were not screened out as insignificant) have been assessed as being unlikely to give rise to significant pollution in that the PEC is less than 100% (taking expected modelling uncertainties into account) of the short-term ES.

- NOx, HCl, TOC, former group 2 metal mercury and PAH.

(iii) Emissions requiring further assessment

Emissions of SO_2 are considered to have the potential to give rise to pollution in that the PEC concentration exceeds 100% of the short-term ES, at 126.6% of the 15-minute (99.9%ile) ES.

As part of our detailed audit of the Applicant's modelling assessment, we agree with the Applicant's conclusions in this respect taking modelling uncertainties into account.

In any case, with respect to SO_2, we have carefully scrutinised the Applicant's proposals to ensure that they are applying the Best Available Techniques to prevent and minimise emissions of SO_2. This is reported in section 6 of this document.

This assessment is based on SO_2 ELVs at the maximum permitted by Annex VI of the IED and not the lower BAT AEL. The Application confirms that concentrations are expected to be significantly lower, refer to section 6 of this document. We have set the lower BAT AEL limit in the Permit which means that the PEC no longer exceeds the short-term ES.

We are therefore satisfied that it is not necessary to further constrain the conditions and duration of the periods of abnormal operation beyond those permitted under Chapter IV of the IED.

We have not assessed the impact of abnormal operations against long-term ESs for the reasons set out above.

5.6 Other Emissions

Refining of Mineral Oil and Gas BAT Conclusion 52
The annual volume of loading will be less than 1 million m^3/year by sea, so the BAT AELs do not apply to this operation (emission point A3).

The annual volume for loading into road tankers will be more than 5,000 m^3/year, so the BAT AELs will apply to this operation (emission point A4).

Vapour recovery will be achieved by re-routing back to the product tanks where it will be re-absorbed into the products.

The vents from the fuel loading systems will be fitted with carbon filters to minimise the release of VOCs.

It is anticipated that this measure will achieve the required BAT AELs. This will be confirmed during detailed design and if necessary a different type of vapour recovery will be employed. We have set a pe-operational condition to address this.

We have set an improvement condition requiring the Operator to develop a monitoring programme for measuring point source emissions of non-methane volatile organic compounds (NMVOCs) and benzene from the loading and unloading of liquid hydrocarbons at emission point A4 as specified in this BAT Conclusion.

We have added the limits and monitoring requirements to table S3.1 of the Permit.

Liquid tank vents

The Applicant confirmed that there are 12 liquid tank vents, with emission points identified as A8 to A19. They have the potential to release a range of hydrocarbons. The assessment was focussed on human health impacts from naphtha, which is the most volatile product.

The ESs used were based upon the United States Department of Labor occupational exposure limits and using our guidance to derive ESs for long and short-term exposure.

Whilst PCs were not screened out as insignificant, they are unlikely to give rise to significant pollution in that the PECs are 20% and 11.7% respectively of the long and short-term ESs. On this basis, no further assessment or detailed modelling was required.

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

6. Application of Best Available Techniques

6.1 Scope of Consideration

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

- We address the choice of thermal treatment technology. The Applicant has explained why they have chosen this particular kind for this Installation.

- We consider control measures for the emissions which were not screened out as insignificant in the previous section on minimising the Installation's environmental impact. They are: NO_2, PM_{10}, $PM_{2.5}$, SO_2, TOC, PAH, Cd, Pb, As and Ni.

- We consider Global Warming Potential.

- We also consider compliance with the Refining of mineral oil and gas BAT Conclusions in Annex 1B of this document.

Chapter IV of the IED specifies a set of maximum emission limit values. Although these limits are designed to be stringent, and to provide a high level of environmental protection, they do not necessarily reflect what can be achieved by this plant.

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

We however consider that the Installation can achieve the more stringent waste incineration BAT AELs (refer to section 6.1.2 of this document), which we have set in the Permit. In any event, should the Installation, once in operation, emit at rates significantly below the limits included in the Permit, there is provision for us to tighten those limits.

We are satisfied that emissions at the permitted limits would ensure a high level of protection for human health and the environment.

6.1.1 Consideration of thermal treatment technology

In the case of the Installation, the technology selected must be able to maximise the quantities of char (for carbon black production) and liquid phases (for production of hydrocarbon feedstocks). These are prioritised over the production of syngas.

To maximise char production, it is desirable to have a slow heating rate, low temperature and long residence time.

To maximise liquid production, it is desirable to have a high heating rate, moderate temperature and short residence time.

Therefore, an optimum balance between these parameters must be taken to maximise the quantities of char and liquid phases.

Three general pyrolysis methods are identified in the Advanced Thermal Treatment (ATT) guidance:

- Conventional;
- Fast; and
- Flash pyrolysis.

Of these three, only the conventional method is appropriate for the desired tyre conversion process as the residence time for fast and flash pyrolysis is too short to maximise the quantity of char production.

Therefore, the assessment of suitable pyrolysis reactors is based on conventional technology which are appropriate for the maximisation of solid and liquid phases.

According to the ATT guidance, the most common pyrolysis reactor types are:

- Batch reactors;
- Rotary reactors; or
- Auger reactors.

The ATT guidance does not provide any information on the relative environmental performance of these three reactor types. Whilst all types may be suitable for the pyrolysis of tyres, the Applicant has selected an auger-based pyrolyser system based on the existing proven technology and operational experience of the system in other countries.

The Applicant provided a document 'Pyrolysis of End-of-Life Tyres Ref WF1.PE1-1200-RPT-002'. This document identified five other locations worldwide which use the thermal conversion technology proposed with throughput ranges from 10,000 to 40,000 tpa. Four of these process tyres with the other processing plastics. They confirmed that there have been no known environmental problems associated with these sites.

We are satisfied that the Applicant has provided sufficient justification to show that their technique is BAT. This is not to say that the other techniques could not also be BAT.

6.1.2 BAT and emissions control

The pyrolysis process and naphtha distillation stages of the process produce a hydrocarbon rich gaseous by-product similar to refinery fuel gas, which is used as a fuel to heat the pyrolysers and carbon black dryers as an integral part of the process.

Due to the relatively high concentrations of pollutants in the raw pyrolyser fuel gas, it undergoes treatment before use as a fuel to provide process heating.

The fuel gas stream produced from the naphtha distillation stage has relatively minor amounts of pollutants and is blended with the cleaned pyrolyser gas before the fuels are used for providing energy for the process.

The raw pyrolyser fuel gas is scrubbed with caustic solution in a packed tower to remove hydrogen sulphide (H_2S), hydrogen chloride (HCl) and carbon dioxide (CO_2). Some of the cleaned gas is burned to provide heat for the carbon pellet dryers, some is blended with the fuel gas from the distillation stage and burned to heat the pyrolysers, and any remaining gas is used to fuel the RTO.

The RTO is also used to treat the combustion gases from the pellet dryers and pyrolyser burners as well as the exhaust gases from combustion of distillate oil in the diesel generators. Natural gas is used as a start-up fuel for the pyrolysis heating system and is also used to supplement the RTO if required.

All combustion emissions are ultimately released from the facility via the RTO. The emissions from the RTO are cooled in a water quench tower followed by removal of oxides of sulphur and any remaining traces of HCl in a caustic scrubber tower, before the cleaned gases are released to atmosphere via the 30m high stack.

This assessment therefore considers the BAT for the abatement of pollutants from the RTO.

The Applicant confirmed that there is currently very little published information on the performance of abatement techniques and costs specific to the pyrolysis of tyres. Therefore, in line with the pre-application advice we provided, the assessment was based on information sourced from:

- Environment Agency guidance - Industrial Waste Management - Establishing a methodology that support the assessment of the impact of ATT processes (Ref ED13600100, issue no. 1, 31 March 2021); and
- The techniques described in the Mineral Oil and Gas Refining Bref.

The key pollutants requiring control in the exhaust gases following combustion of fuel gas from tyre pyrolysis include:

- Acid gases: SO_2, HCl and hydrogen bromide (HBr);
- Nitrogen dioxide; and
- Tar and particulate.

Pollutant	Typical Fuel Gas Unabated Emission[1] (mg/m^3)	Estimated RTO Unabated Emission (mg/m^3)	Estimated RTO Emission Post Abatement (mg/m^3)	Annex IV Emission Limit (mg/m^3)
SO_2	1 -20	198 - 423	4 - 7	50
NOx	<100	49 - 99	5 - 9	200
Particulate	1	<1	<1	10

[1] Table 3.56 of the Bref – assumes 100% fuel gas combustion

6.2.1 Particulate Matter and metals

Wet scrubbing is used to clean the gas before it is burned, as well as treating the exhaust gases from the RTO. This technique achieves a very high dust removal performance. The Applicant concluded that an appraisal of further abatement options was not necessary. Given the low concentration of unabated particulate at <1 mg/m^3, we agree with this conclusion.

The prevention and minimisation of metal emissions is achieved through the effective removal of particulate matter.

Whilst emissions of particulate matter and some metals cannot be screened out as insignificant; the assessment was based on Annex VI limits and not the lower BAT AELs. Estimated RTO emissions post abatement are significantly lower.

We agree that the Applicant's proposed technique is BAT for the Installation.

6.2.2 Oxides of Nitrogen

Combustion equipment will be selected to minimise NOx emissions.

It is anticipated that use of the RTO to treat the recirculated exhaust gases will result in low NOx emissions (less than 100 mg/m^3). After scrubbing, the NOx emissions are predicted to be less than 10 mg/m^3.

Given that the NOx concentrations in the exit gas from the wet scrubber would be very low, it was considered that the benefits of any further abatement would be extremely marginal, and the costs would be hugely disproportionate. Therefore, an appraisal of NOx abatement options was not considered necessary.

Whilst emissions of NOx cannot be screened out as insignificant; the assessment was based on Annex VI limits and not the lower BAT AEL. Estimated RTO emissions post abatement are significantly lower.

We agree that the Applicant's proposed technique is BAT for the Installation.

6.2.3 Acid Gases, SOx, HCl and HF

The pyrolyser gas is scrubbed to remove sulphur and halogen compounds before use as a fuel in the process.

The exhaust gas from diesel generators contains sulphur; however, this is treated following combustion in the RTO by wet scrubbing. Emissions of SO_2 are expected to be less than 10 mg/m^3.

The Applicant has considered wet, dry and semi-dry methods of secondary measures for acid gas abatement. Any of these methods can be BAT for this type of facility.

Wet scrubbing produces an effluent for treatment and disposal in compliance with Article 46(3) of IED. Wet scrubbing is likely to be BAT where the exhaust gas contains elevated concentrations of acid gas and metal components. It is also effective in removing particulate and tar.

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

An assessment of options for acid gas abatement concluded that all options assessed would achieve the high degree of performance to meet the required mandatory standards. The main difference in environmental performance and

cost-effectiveness between the options relates to the amount of residues and their disposal costs as well as energy use.

On the basis that wet scrubbing performs best in more environmental categories than dry or semi-dry scrubbing it is considered that this represents BAT for the facility.

Whilst emissions of SO_2 cannot be screened out as insignificant; the assessment was based on Annex VI limits and not the lower BAT AEL. Estimated RTO emissions post abatement are significantly lower.

In this case, the Applicant proposes to use wet scrubbing. The Environment Agency is satisfied that this is BAT.

6.2.4 Carbon monoxide and volatile organic compounds (VOCs)

Emissions of CO from the RTO exhaust are expected to be approximately 10 mg/m^3.

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

6.3 BAT and global warming potential

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

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

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

Factors influencing GWP and CO_2 emissions from the Installation are:
On the debit side

- CO_2 emissions from the burning of the pyrolysis gas;
- CO_2 emissions from burning auxiliary or supplementary fuels; and
- CO_2 emissions associated with electrical energy used.

On the credit side

- CO_2 saved from the RTO closed loop hot oil heating/cooling circuit, which provides heat for the pyrolysis and distillation activities, displacing burning of virgin fuels; and
- CO_2 saved from the manufacture of the products from virgin sources.

The GWP of the plant will be dominated by the emissions of carbon dioxide that are released as a result of pyrolysis gas combustion. This will be constant for all options considered in the BAT assessment. Any differences in the GWP of the options in the BAT appraisal will therefore arise from the use of alternative heat and power sources.

Taking all these factors into account, the Applicant's assessment shows that the difference in GWP between the best option in terms of GWP and the Applicant's preferred option is minor. The purpose of a BAT appraisal is to determine which option minimises the impact on the environment as a whole. In this context the small benefit in terms of GWP of the other options is considered to be more than offset by the other benefits of the preferred option.

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

6.4 Other Emissions to the Environment

6.4.1 Emissions to water

Uncontaminated rainfall run off from roofs and non-processing areas is collected in the 'clean' drainage system and will be discharged to the adjacent dock via a silt trap and oil separator at emission point W1.

Surface water run-off which is potentially contaminated is collected in a separate sealed drainage system and passes through an oil/water separator which separates oil and floating debris in one stream and removes solids heavier than water (mainly char, rCB and dust from shredding) as a sludge. The oil and sludge residues are transferred off-site for treatment at an appropriately regulated facility. The resulting effluent will be transferred by road tanker to an appropriately regulated facility.

The main sources of dirty water from the process are from tank bunds, water from wash-down of buildings and process areas and blow-down from the cooling water system. These effluents will also be tankered off site for treatment at an appropriately regulated facility.

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

6.4.2 Fugitive emissions (soil, surface water and groundwater)

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

Based upon the information in the application we are satisfied that appropriate measures will be in place to prevent and /or minimise emissions to soil, surface water and groundwater.

6.4.3 Fugitive emissions (diffuse VOCs to air)

Refinery BAT Conclusion 6 requires monitoring of diffuse VOCs, using sniffing methods, optical gas imaging and calculations based on emission factors. The Application confirms that this will be undertaken in accordance with Annex VI of the IED; however this does not secure compliance with this BAT Conclusion. We have set a pre-operational condition to secure compliance.

Refinery BAT Conclusion 18 requires control of diffuse VOCs. The plant design incorporates features designed to minimise fugitive VOC emissions.

A commissioning plan will be developed to ensure that the plant is installed according to the design. We have set a pre-operational condition to secure this requirement

A risk-based leak detection and repair (LDAR) programme will be developed for the site. We have set a pre-operational condition to secure this requirement, with the approved plan being included in table S1.2 operating techniques.

Based upon the information in the Application and the pre-operational conditions, we are satisfied that appropriate measures will be in place to prevent and /or minimise fugitive emissions to air.

6.4.4 Odour

Potential odour sources relate to fugitive emissions associated with the emissions released by the stack following pyrolysis/combustion as well as the distillation, fuel storage and loading systems.

End-of-life tyres are not an inherently odorous waste and the site will have waste acceptance procedures in place including checks for any contamination by odorous material. Checks are made upon arrival as well as when each bale is opened within the shredder building. In the event that non-conforming wastes are delivered to the site, they will be returned to the delivery vehicle or quarantined. Whilst bale storage is within an open fronted building, the opening of bales and all subsequent handling and pre-treatment of tyres takes place in enclosed buildings and conveyors.

The intensity of off-site odours relating to tyre storage and pre-treatment is therefore likely to be low.

The facility will employ a RTO where all non-condensable combustible gas not used to heat the pyrolysis process would be directed. It is considered that combustion of the gases in this unit will effectively remove any odorous compounds contained in the feed gas before the emissions are exhausted to the atmosphere.

All finished products including recovered carbon black and liquid hydrocarbon fuels will be stored within sealed containers.

Tank vents and fuel loading systems will be fitted with nitrogen purge and carbon filters to minimise release of VOCs. A risk-based LDAR system will be operated at the site, refer to section 6.4.3 of this document.

Meteorological data illustrates that there is a predominant south-westerly wind direction (i.e. away from land receptors to the north-sea).

The site will be kept clean and tidy by way of a regularised housekeeping regime and regular checks will be undertaken by the Plant Manager or designated individual of odour at the site boundary.

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

6.4.5 Noise and vibration

The Application contained a noise impact assessment (NIA) which identified local noise-sensitive receptors, potential sources of noise at the proposed plant and noise attenuation measures. Measurements were taken of the prevailing ambient noise levels to produce a baseline noise survey and an assessment was carried out in accordance with BS 4142:2014 to compare the predicted plant rating noise levels with the established background levels.

A revised NIA (V2) was provided, taking into account changes to the original proposed site layout and our request for information on the original NIA. As a consequence of the revised conclusions, a Noise Management Plan (NMP) was also submitted.

Our request for information on the original submission included the following:

- Background sound data;
- Source sound data;
- Calculation method and assumptions;
- Acoustic feature corrections;
- Mitigation; and
- BS4142 assessment and context.

The Applicant confirmed that the main noise producing areas/plant are:

- Tyre shredding building;
- Pyrolysis building;
- Palletiser building;
- Two external generators;
- Various external fixed plant items; and
- Moving external plant, including HGVs and forklift trucks.

The BS 4142 standard was used to assess the impacts from the site. It does this by comparing the sound from the new site (defined in BS 4142 as the rating sound level) to the existing sound without the site running (defined in BS 4142 as the background sound level). The general context of the site is also considered. BS 4142 then uses this comparison to define impacts. Regarding impacts BS 4142 states:

- Typically, the greater this difference, the greater the magnitude of impact;
- A difference of around +10dB or more is likely to be an indication of a **significant adverse** impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an **adverse** impact, depending on the context; and
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant impact.

The revised NIA concluded that:

- During the day-time, the predicted rating level at the receptors is between 1dB below and 8dB above the corresponding background sound level;
- During the night-time, the predicted rating level at the receptors is between 6dB and 13dB above the corresponding background sound level; and
- Mitigation is required and is detailed in the NMP, see below.

We therefore conclude that there is potential for significant adverse impact from the facility such that activities carried out at the site have the potential to cause noise and/or vibration that might cause pollution outside the site and consider it appropriate to set a pre-operational condition, see below.

The NMP included the following model updates and mitigation measures:

- Removed the two engine generator stacks, which exhaust to the main 30m stack;
- Sound power level of each pump is 85dB(A) at a height of 0.5m;
- A barrier was added to shield the western most pump; and
- The façade reduction of the tyre shredding building was improved from 24dB to 27dB by a steel sheet with double trapezoidal corrugations.

With the above measures in place, during the day-time, the rating level does not exceed the background sound level, and at night the difference will be no more than 5dB(A). They conclude that it is unlikely that residential receptors will be impacted by noise from the site.

We conclude that:

- Without mitigation, the NIA has presented BS 4142 impacts of below adverse to adverse during the day, and adverse to significant adverse at night-time;
- With the proposed mitigation measures in place, this reduces to low impacts during the day, and below adverse to adverse at night-time;
- We agree that additional mitigation is required to control the predicted impacts at the noise sensitive receptors;
- We agree that the proposed mitigation measures would be effective in reducing the specific sound levels and corresponding BS 4142 impacts;
- As adverse impacts have been predicted with the proposed mitigation in place, the site should be working to BAT (Best available techniques: environmental permits - GOV.UK (www.gov.uk).

We assessed the NMP and concluded that it did not address all the necessary requirements. Omissions include:

- Description of noise emitting processes are not consistent with table 3.2 in our NMP template;
- There is no description of the operations on-site, with reliance upon the NIA;
- Locations of sound sources is unknown;
- Mitigation measures are proposed; however there is no mention why they are considered BAT for the sector;
- Proposed acoustic barrier is to be constructed to a minimum density of 10 Kg/m^2 with no gaps or holes in the construction;
- Periodic inspection and maintenance plan for the acoustic barrier to reduce the risk of reduction in acoustic performance;
- Monitoring is recommended, although there is no firm commitment to do this; and
- The complaint procedure isn't consistent with our NMP template.

We have included a pre-operational condition in the Permit requiring submission of an updated NMP in accordance with our guidance at Noise and vibration management: environmental permits - GOV.UK (www.gov.uk) and including details of the construction, inspection and maintenance of the acoustic barrier.

6.5 Setting ELVs and other Permit conditions

6.5.1 Translating BAT into Permit conditions

Article 14(3) of IED states that BAT Conclusions shall be the reference for Permit conditions. Article 15(3) further requires that under normal operating conditions; emissions do not exceed the emission levels associated with the best available techniques as laid down in the decisions on BAT Conclusions.

The Installation does not fall within the scope of the Waste Incineration BAT Conclusions published 12 November 2019; however it can achieve the relevant waste incineration BAT AELs. We have as part of our obligation to achieve a high level of protection for the environment, exercised our discretion to impose these.

The use of IED Chapter IV emission limits for air dispersion modelling sets the worst-case scenario. If this shows emissions are insignificant then we have accepted that the Applicant's proposals are BAT, and that there is no justification to reduce ELVs below the BAT AELs and Chapter IV limits.

(i) Local factors

We would not consider it practical or reasonable to expect the Applicant to go beyond what is considered BAT for the control of NO_2, particulate, SO_2, TOC, PAH, Cd, Pb, As and Ni.

(ii) National and European ESs

We do not expect emissions from the Installation to cause an exceedance of an EQS. In view of this, Article 18 of IED does not require any tighter conditions than we have already applied.

(iii) Global Warming

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

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

(iv) Commissioning

The Application refers to commissioning and the validation of combustion conditions for the pyrolysis plant. We have secured this by setting a pre-operational condition.

We have also set a pre-operational condition requiring a commissioning plan including timelines for completion. The commissioning plan will include the expected actual emissions (rather than the permitted emissions) to the environment during the different stages of commissioning, the expected durations of commissioning activities and the actions to be taken to protect the environment and report to the Environment Agency in the event that actual emissions exceed expected emissions. Commissioning shall be carried out in accordance with the commissioning plan as approved.

6.6 Monitoring

6.6.1 Monitoring during normal operations

We have decided that monitoring should be carried out for the parameters listed in Schedule 3 using the methods and to the frequencies specified in those tables. These monitoring requirements have been imposed in order to demonstrate compliance with ELVs and to enable correction of measured concentration of substances to the appropriate reference conditions; to establish data on the release of dioxin-like PCBs and PAHs from the pyrolysis process and to deliver the requirements of Chapter IV of the IED for monitoring of temperature in the combustion chamber.

For emissions to air, the methods for continuous and periodic monitoring are in accordance with the Environment Agency's Guidance at Monitoring stack emissions: guidance for selecting a monitoring approach - GOV.UK (www.gov.uk) for monitoring of stack emissions to air.

The Applicant has proposed a reduced monitoring approach in accordance with Annex VI of the IED, set out in section 2.6(a) of part 6 (monitoring of emissions), refer to section 6.6.3 of this document.

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

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

The Operator has stated that they will not provide back-up CEMS working in parallel to the operating CEMS. They propose to have alternative contingency measures in place in the event of interruption to the CEMS. This is likely to be based on a combination of measures such as procuring a CEMS support package for timely repair, monitoring of RTO inputs and operational parameters to confirm steady state operation and use of alternative testing methods.

Table S3.1(a) of the Permit allows for alternative surrogates to be used during failure of the CEMS which will need to be agreed in writing with us. Permit condition 2.3.12 limits abnormal operation and table S3.1(a) sets limits for particulate matter, TOC and CO which must be met during abnormal operation.

6.6.3 Emissions monitoring for dioxins and heavy metals

The BAT Conclusions specify either manual extractive monitoring or long-term monitoring for dioxins. For mercury either continuous or long-term monitoring is specified, manual extractive monitoring is specified for other metals.

For dioxins long term monitoring does not apply if emissions are stable, and for mercury long term monitoring can be used instead of continuous if the mercury content of the waste is low and stable.

Based on the mercury content in waste tyres (Applicant has used analysis sponsored by the European Commission in 2004 which characterises the elemental metal content of tyre rubber at: (https://www.groundsmartrubbermulch.com/docs/resources/Measurement-of-non-exhaust-particulate-matter.pdf) and control measures proposed in the Application we expect that emissions of mercury will be low and stable.

We expect that emissions of dioxins will be stable.

We have therefore set manual extractive monitoring in the Permit for mercury.

For dioxins we have set manual extractive monitoring, together with an improvement condition requiring the stable and low criteria to be demonstrated. We can require long term monitoring for dioxins if required.

The Applicant requested a reduction in monitoring frequency for mercury and dioxins as set out in Annex VI of the IED as follows:

The competent authority may decide to require one measurement every 2 years for heavy metals and one measurement per year for dioxins and furans in the following cases:

a) the emissions resulting from co-incineration or incineration of waste are under all circumstances below 50 % of the emission limit values;
b) the waste to be co-incinerated or incinerated consists only of certain sorted combustible fractions of non-hazardous waste not suitable for recycling and presenting certain characteristics, and which is further specified on the basis of the assessment referred to in point (c);
c) the operator can prove on the basis of information on the quality of the waste concerned and the monitoring.

We have included provision in table S3.1 of the Permit for a reduction in monitoring frequency for mercury if appropriate.

For dioxins we cannot be certain about the chlorine content of the waste tyres (Chlorinated Paraffins in Car Tires Recycled to Rubber Granulates and Playground Tiles - PMC (nih.gov)). On this basis we have not included the provision in table S3.1 of the Permit for the reduction in monitoring frequency.

6.7 Reporting

We have specified the reporting requirements in Schedule 4 of the Permit either to meet the reporting requirements set out in the IED, or to ensure data is reported to enable timely review by the Environment Agency to ensure compliance with Permit conditions, to monitor the efficiency of material use and the use of fuels at the Installation.

7 Other legal requirements

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

7.1 Directive 2003/35/EC – **The Public Participation Directive**

Regulation 60 of the EPR 2016 requires the Environment Agency to prepare and publish a statement of its policies for complying with its public participation duties. We have published our public participation statement.

This Application has been consulted upon in line with this statement, as well as with our guidance RGS6 on Sites of High Public Interest, which addresses specifically extended consultation arrangements for determinations where public interest is particularly high. This satisfies the requirements of the Public Participation Directive.

Our decision in this case has been reached following a programme of extended public consultation, on the original application. The way in which this has been done is set out in section 2.2 of this document. A summary of the responses received to our consultations and our consideration of them is set out in Annex 4 of this document.

7.2 National Air Pollution Control Programme

We have considered the National Air Pollution Control Programme as required by the National Emissions Ceilings Regulations 2018. By setting emission limit values in line with technical guidance we are minimising emissions to air. This will aid the delivery of national air quality targets. We do not consider that we need to include any additional conditions in this Permit.

7.3 Growth duty

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

Paragraph 1.3 of the guidance says:
“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”

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

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

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

Fuel gas produced by the pyrolysers and distillation process is used solely for provision of process heating on site. This is common practice for refinery processes. In the case of fuel gas produced from the conversion of waste, we require that the waste incineration requirements of the IED are applied to the combustion of the gas. This is because the gas does not meet end-of-waste (using natural gas as a comparator) or emissions equivalent to the combustion of natural gas. Accordingly, the following sections summarise how the proposed facility will comply with the requirements of Chapter IV of the IED.

IED Article	Requirement	Delivered by
45(1)(a)	The Permit shall include a list of all types of waste which may be treated using at least the types of waste set out in the European Waste List established by Decision 2000/532/EC, if possible, and containing information on the quantity of each type of waste, where appropriate.	Condition 2.3.4(a) and table S2.2 in Schedule 2 of the Permit.
45(1)(b)	The Permit shall include the total waste incinerating or co-incinerating capacity of the plant.	Condition 2.3.4(a) and table S2.2 in Schedule 2 of the Permit.
45(1)(c)	The Permit shall include the limit values for emissions into air and water.	Conditions 3.1.1 and 3.1.2 and tables S3.1 and S3.1(a) in Schedule 3 of the Permit.
45(1)(d)	The Permit shall include the requirements for pH, temperature and flow of waste-water discharges.	Not Applicable
45(1)(e)	The Permit shall include the sampling and measurement procedures and frequencies to be used to comply with the conditions set for emissions monitoring.	Conditions 3.6.1 to 3.6.4 and tables S3.1, S3.1(a) and S3.3 in Schedule 3 of the Permit.
45(1)(f)	The Permit shall include the maximum permissible period of unavoidable stoppages, disturbances or failures of the purification devices or the measurement devices, during which the emissions into the air and the discharges of waste-water may exceed the prescribed emission limit values.	Conditions 2.3.12 and 2.3.13.

IED Article	Requirement	Delivered by
45(2)(a)	The Permit shall include a list of the quantities of the different categories of hazardous waste which may be treated.	Not Applicable
45(2)(b)	The Permit shall include the minimum and maximum mass flows of those hazardous waste, their lowest and maximum calorific values and the maximum contents of polychlorinated biphenyls, pentachlorophenol, chlorine, fluorine, sulphur, heavy metals and other polluting substances.	Not Applicable
46(1)	Waste gases shall be discharged in a controlled way by means of a stack the height of which is calculated in such a way as to safeguard human health and the environment.	Condition 2.3.1 and table S1.2 of Schedule 1 of the Permit.
46(2)	Emission into air shall not exceed the emission limit values set out in parts 4 or determined in accordance with part 4 of Annex VI.	Conditions 3.1.1 and 3.1.2 and tables S3.1 and S3.1a in Schedule 3 of the Permit.
46(3)	Relates to conditions for water discharges from the cleaning of exhaust gases.	There are no such discharges as condition 3.1.1 prohibits this.
46(4)	Relates to conditions for water discharges from the cleaning of exhaust gases.	There are no such discharges as condition 3.1.1 prohibits this.
46(5)	Prevention of unauthorised and accidental release of any polluting substances into soil, surface water or groundwater. Adequate storage capacity for contaminated rainwater run-off from the site or for contaminated water from spillage or fire-fighting.	The application explains the measures to be in place for achieving the directive requirements. The Permit requires that these measures are used. Various Permit conditions address this and when taken as a whole they ensure compliance with this requirement.
46(6)	Limits the maximum period of operation when an ELV is exceeded to 4 hours uninterrupted duration in any one instance, and with a maximum cumulative limit of 60 hours per year.	Conditions 2.3.11 and 2.3.12.

IED Article	Requirement	Delivered by
47	In the event of breakdown, reduce or close down operations as soon as practicable.	Condition 2.3.12.
48(1)	Monitoring of emissions is carried out in accordance with Parts 6 and 7 of Annex VI.	Conditions 3.2.1, 3.2.2, 3.6.1 to 3.6.4, tables S3.1 and S3.1(a) in Schedule 3 of the Permit. Reference conditions are defined in Schedule 6 of the Permit.
48(2)	Installation and functioning of the automated measurement systems shall be subject to control and to annual surveillance tests as set out in point 1 of Part 6 of Annex VI.	Conditions 3.6.1, 3.6.3 and tables S3.1 and S3.1(a) in Schedule 3 of the Permit.
48(3)	The competent authority shall determine the location of sampling or measurement points to be used for monitoring of emissions.	Condition 3.6.1 and pre-operational condition PO6.
48(4)	All monitoring results shall be recorded, processed and presented in such a way as to enable the competent authority to verify compliance with the operating conditions and emission limit values which are included in the Permit.	Conditions 4.1.1 and 4.1.2 and tables S4.1 and S4.4 in Schedule 4 of the Permit.
49	The emission limit values for air and water shall be regarded as being complied with if the conditions described in Part 8 of Annex VI are fulfilled.	Conditions 3.1.1, 3.1.2, 3.2.1, 3.2.2 and tables S3.1 and S3.1(a) in Schedule 3 of the Permit.
50(1)	Slag and bottom ash to have Total Organic Carbon (TOC) < 3% or loss on ignition (LOI) < 5%.	Not applicable
50(2)	Flue gas to be raised to a temperature of 850ºC for two seconds, as measured at representative point of the combustion chamber.	Condition 2.3.7, pre-operational condition PO6 and improvement condition IC4 and table S3.3 in Schedule 3 of the Permit.
50(3)	At least one auxiliary burner which must not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil liquefied gas or natural gas.	Not applicable

IED Article	Requirement	Delivered by
50(4)(a)	Automatic shut-down to prevent waste feed if at start up until the specified temperature has been reached.	Condition 2.3.7
50(4)(b)	Automatic shut-down to prevent waste feed if the combustion temperature is not maintained.	Condition 2.3.7
50(4)(c)	Automatic shut-down to prevent waste feed if the CEMs show that ELVs are exceeded due to disturbances or failure of waste cleaning devices.	Condition 2.3.7
50(5)	Any heat generated from the process shall be recovered as far as practicable.	Condition 1.2.1
50(6)	Relates to the feeding of infectious clinical waste into the furnace.	No infectious clinical waste will be burnt
50(7)	Management of the Installation to be in the hands of a natural person who is competent to manage it.	Conditions 1.1.1 to 1.1.3 and 2.3.1.
51(1)	Different conditions than those laid down in Article 50(1), (2) and (3) and, as regards the temperature Article 50(4) may be authorised, provided the other requirements of this chapter are me.	No such conditions Have been allowed
51(2)	Changes in operating conditions do not cause more residues or residues with a higher content of organic polluting substances compared to those residues which could be expected under the conditions laid down in Articles 50(1), (2) and (3).	No such conditions Have been allowed
51(3)	Changes in operating conditions shall include emission limit values for CO and TOC set out in Part 3 of Annex VI.	No such conditions Have been allowed
52(1)	Take all necessary precautions concerning delivery and reception of Wastes, to prevent or minimise pollution.	Conditions 2.3.1, 2.3.3, 3.3, 3.4, 3.5 and 3.7
52(2)	Determine the mass of each category of wastes, if possible, according to the EWC, prior to accepting the waste.	Condition 2.3.4(a) and table S2.2 in Schedule 3 of the Permit.
52(3)	Prior to accepting hazardous waste, the operator shall collect available information about the waste for the purpose of compliance with the Permit requirements specified in Article 45(2).	Not Applicable
52(4)	Prior to accepting hazardous waste, the operator shall carry out the procedures set out in Article 52(4).	Not Applicable

IED Article	Requirement	Delivered by
52(5)	Granting of exemptions from Article 52(2), (3) and (4).	Not Applicable
53(1)	Residues to be minimised in their amount and harmfulness and recycled where appropriate.	Conditions 1.4.1 and 1.4.2.
53(2)	Prevent dispersal of dry residues and dust during transport and storage.	Conditions 1.4.1, 2.3.1, 2.3.2 and 3.3.1.
53(3)	Test residues for their physical and chemical characteristics and polluting potential including heavy metal content (soluble fraction).	Not applicable
55(1)	Application, decision and Permit to be publicly available.	All documents are accessible from the Environment Agency Public Register.
55(2)	An annual report on plant operation and monitoring for all plants burning more than 2 tonne/hour waste.	Conditions 4.2.2 and 4.2.3.

ANNEX 1B: Compliance with Refining of mineral oil and gas BAT Conclusions

BAT Conclusion	Criteria	Delivered by
General BAT Conclusions		
1	Implement environmental management system	Condition 1.1 and pre-operational condition.
2	Energy efficiency	Refer to section 4.3.7 of this decision document. Permit table S4.3.
3	Storage and handling of dusty materials	Condition 3.3.1 and 3.3.2.
4	Monitoring emissions to air	Condition 3.6.1 and table S3.1.
5	Monitor combustion unit process parameters	Condition 3.6.1 and table S3.1.
6	Monitoring diffuse VOCs	Condition 1.1 and pre-operational condition.
7	Reduce emissions to air by optimisation of waste gas treatment systems	Condition 1.1.
8	Ammonia emissions when applying SCR/SNCR	Not applicable, neither techniques are employed.
9	Emissions from sour water stream stripping	The Application explains the measures that will be used . Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit.
10	Monitor emissions to water	Not applicable, no emissions of process effluent
11	Reduce water consumption	The Application explains the measures that will be used. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit.
12	Reduce emissions to water	Measures are described in the Application and FPP. Permit conditions 2.3.1, 3.7 and table S1.2 in Schedule 1 of the Permit.
13	Additional waste-water treatment	Not applicable, there are no direct waste-water discharges from the process.

BAT Conclusion	Criteria	Delivered by
14	Reduce waste generation	The Application explains the measures that will be used. Permit condition 1.4.
15	Reduce sludge production	Not applicable, no sludge will be generated by the process.
16	Reduce generation of spent catalyst	Not applicable, catalysts will not be used in the process.
17	Reduce noise	The Application explains the measures that will be used. Permit condition 3.5.
18	Techniques to reduce diffuse VOCs	The Application explains the measures that will be used. Permit condition 3.3 and pre-operational condition.
BAT Conclusions 19 to 21 not applicable (applicable to alkylation) BAT Conclusion 22 not applicable (applicable to base oil production process) BAT Conclusion 23 not applicable (applicable to the bitumen process) BAT Conclusions 24 to 27 not applicable (applicable to fluid catalytic cracking) BAT Conclusion 28 not applicable (applicable to catalytic reforming) BAT Conclusions 29 to 32 not applicable (applicable to coking) BAT Conclusion 33 not applicable (applicable to desalting)		
34	Techniques to reduce NOx emissions from combustion units	Measures described in the Application. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 6.2.2 of this decision document.
35	Techniques to reduce dust and metal emissions from combustion units	Measures described in the Application. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 6.2.1 of this decision document.
36	Techniques to reduce SOx emissions from combustion units	Measures described in the Application. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 6.2.3 of this decision document

BAT Conclusion	Criteria	Delivered by
37	Techniques to reduce CO emissions from combustion units	Measures described in the Application. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 6.2.4 of this decision document.
BAT Conclusions 38 and 39 not applicable (applicable to etherification) BAT Conclusion 40 not applicable (applicable to isomerisation) BAT Conclusions 41 to 43 not applicable (applicable to natural gas refinery)		
Distillation process		
44	Reduce waste-water	Measures described in the Application. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 4.2 of this decision document.
45	Reduce water pollution	Measures described in the Application. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 4.2 of this decision document.
46	Reduce emissions to air	Measures described in the Application. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 6 of this decision document.
Products treatment process		
47	Reduce emissions to air	Measures described in the Application. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit.

BAT Conclusion	Criteria	Delivered by
48	Reduce VOCs from storage	Measures described in the Application. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 6 of this decision document.
Storage and handling processes		
49	Reduce VOC emissions from storage	Measures described in the Application. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 6.4.3 of this decision document.
50	Reduce VOC emissions from storage during cleaning	Measures described in the Application. Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 6.4.3 of this decision document.
51	Reduce emissions to soil and groundwater	Measures described in the Application. Permit conditions 2.3.1, 3.3.4 and table S1.2 in Schedule 1 of the Permit. Section 4.2.1 of this decision document.
52	Reduce VOC emissions from loading and unloading	Measures described in the Application. Permit condition 2.3.1 and tables S1.2 and S3.1 in Schedules 1 and 3 of the Permit. Section 5.6 of this decision document.
BAT Conclusion 53 not applicable (applicable to visbreaking)		

BAT Conclusion	Criteria	Delivered by
Waste gas sulphur treatment		
54	Reduce sulphur emissions to air	Measures described in the Application. Permit condition 2.3.1 and tables S1.2 and S3.1 in Schedules 1 and 3 of the Permit. Section 6.2.3 of this decision document.
Flares		
55	Prevent emissions to air	Measures described in the Application Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 4.1.2 of this decision document.
56	Techniques to reduce emissions to air	Measures described in the Application Permit condition 2.3.1 and table S1.2 in Schedule 1 of the Permit. Section 4.1.2 of this decision document
BAT Conclusions 57 and 58 not applicable (applicable to integrated emission management)		

ANNEX 2: Pre-Operational Conditions

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

Table S1.4 Pre-operational measures	
Ref	**Pre-operational measures**
PO1	<u>EMS summary</u> At least three months before the commencement of commissioning (or other date agreed in writing with the Environment Agency), the operator shall send a summary of the site Environment Management System (EMS) to the Environment Agency and obtain the Environment Agency's written approval to it. The operator shall make available for inspection all documents and procedures which form part of the EMS. The EMS shall be developed in line with the requirements set out in Environment Agency web guide on developing a management system for environmental permits (found on www.gov.uk). The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit.
PO2	<u>Commissioning plan</u> At least three months before the commencement of commissioning (or other date agreed in writing with the Environment Agency), the operator shall submit to the Environment Agency, and obtain the Environment Agency's written approval to it, a written commissioning plan, including timelines for completion, for approval by the Environment Agency. The commissioning plan shall include the expected emissions to the environment during the different stages of commissioning, the expected durations of commissioning activities and the actions to be taken to protect the environment and report to the Environment Agency in the event that actual emissions exceed expected emissions. Commissioning shall be carried out in accordance with the commissioning plan as approved.
PO3	<u>Noise management plan (NMP)</u> At least three months before the commencement of commissioning (or other date agreed in writing with the Environment Agency), the operator shall submit to the Environment Agency, and obtain the Environment Agency's written approval to it, an updated NMP in

Table S1.4 Pre-operational measures	
Ref	**Pre-operational measures**
	accordance with our guidance on noise and vibration management for environmental permits (found on www.gov.uk). The plan shall include the construction parameters of the acoustic barrier and the inspection and maintenance plan.
PO4	Product storage tank inventory At least three months before the commencement of commissioning (or other date agreed in writing with the Environment Agency), the operator shall submit updated documents and plans as necessary to the Environment Agency, and obtain the Environment Agency's written approval to them, detailing the tank inventory and product storage arrangements at the facility.
PO5	Monitoring At least three months before (or other date agreed in writing with the Environment Agency) the commencement of commissioning, the operator shall submit a written report to the Environment Agency, and obtain the Environment Agency's written approval to it, specifying arrangements for continuous and periodic monitoring of emissions to air to comply with Environment Agency guidance found on www.gov.uk: • Monitoring stack emissions: measurement locations (formerly M1); • Monitoring stack emissions: guidance for selecting a monitoring approach (formerly part of M2); • Monitoring stack emissions: environmental permits (formerly part of M2); and • M20 quality assurance of continuous emission monitoring systems. The report shall include the following: • Plant and equipment details, including accreditation to MCERTS; • Methods and standards for sampling and analysis; and • Details of monitoring locations, access and working platforms.
PO6	Validation of combustion conditions At least three months before the commencement of commissioning (or other date agreed in writing with the Environment Agency) the operator shall submit, for approval by the Environment Agency, a methodology (having regard to Technical Report P4-100/TR Part 2 Validation of Combustion Conditions) to verify the residence time, minimum temperature and oxygen content of the gases in the RTO whilst operating under normal load, minimum turn down and overload conditions.
PO7	Refining of Mineral Oil and Gas BAT Conclusion 6 At least three months before the commencement of commissioning (or other date agreed in writing with the Environment Agency) the

Table S1.4 Pre-operational measures	
Ref	**Pre-operational measures**
	operator shall submit a diffuse VOC monitoring plan to the Environment Agency for written approval. This shall include but not necessarily be limited to: • The nature of the material handled; • The sources of emissions; • Justification of the monitoring techniques selected; and • How the monitoring data will be recorded and reviewed. The plan shall take into account the appropriate techniques for VOC monitoring specified in BAT conclusion 6. The operator shall implement the approved plan and produce and submit an annual report on the results of the monitoring undertaken under the plan in accordance with permit condition 4.2.2.
PO8	<u>Refining of Mineral Oil and Gas BAT Conclusion 18</u> At least three months before the commencement of commissioning (or other date agreed in writing with the Environment Agency) the operator shall submit a leak detection and repair (LDAR) programme to the Environment Agency for written approval. This shall include the following: • Identification of process equipment and pipework from which leaks of hydrocarbons or other chemicals, with the potential for environmental harm, may occur; • The techniques that will be applied for leak detection; • A programme of leak detection for the equipment and pipework identified in the first bullet above; and • A register of leaks identified, and repairs undertaken (LDAR register).
PO9	<u>Refining of Mineral Oil and Gas BAT Conclusion 52</u> At least three months before the commencement of commissioning (or other date agreed in writing with the Environment Agency) the operator shall submit a report to the Environment Agency for written approval detailing the vapour recovery measures in place to comply with this BAT Conclusion and the limits specified for emission point A4 in table S3.1 of this permit.
PO10	Drainage and containment plans At least three months before the commencement of commissioning (or other date agreed in writing with the Environment Agency) the operator shall submit site plan(s) to the Environment Agency for written approval, which include the following: • Drainage systems; • Flood defences; and • Bunds and kerbing.
PO11	<u>Emergency flare (emission point A2)</u> At least three months before the commencement of commissioning

Table S1.4 Pre-operational measures	
Ref	**Pre-operational measures**
	(or other date agreed in writing with the Environment Agency) the operator shall provide details of the flare design, operation and monitoring to the Environment Agency for written approval. This shall be in accordance with our Onshore oil and gas sector guidance (8. Flares at onshore oil and gas sites) found on www.gov.uk.
PO12	Fire Prevention Plan (FPP) Prior to the commencement of commissioning (or other date agreed in writing with the Environment Agency), the operator shall submit to the Environment Agency, and obtain the Environment Agency's written approval to it, a written FPP. The FPP shall be in accordance with our guidance on fire prevention plans: environmental permits found on www.gov.uk. The FPP shall be implemented in accordance with the plan as approved.

ANNEX 3: Improvement Conditions

Based in the information in the Application we consider that we need to set improvement conditions. These conditions are set out below - justifications for these is provided at the relevant section of the decision document. We are using these conditions to require the Operator to provide the Environment Agency with details that need to be established or confirmed during and/or after commissioning.

Table S1.3 Improvement programme requirements		
Ref	**Requirement**	**Date**
IC1	EMS certification The operator shall submit a written report to the Environment Agency on the implementation of its Environmental Management System (EMS) and the progress made in the certification of the system by an external body or if appropriate submit a schedule by which the EMS will be certified.	Within 12 months of the completion of commissioning
IC2	Commissioning The operator shall submit a written report to the Environment Agency on the commissioning of the installation. The report shall summarise the environmental performance of the plant as installed against the design parameters set out in the Application. The report shall also include a review of the performance of the facility against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions and confirm that the EMS has been updated accordingly.	Within 4 months of the completion of commissioning
IC3	Validation testing The operator shall notify the Environment Agency of the proposed date(s) that validation testing is planned for.	Notification at least 3 weeks prior to validation testing
	During commissioning the operator shall carry out validation testing to validate the residence time, minimum temperature and oxygen content of the gases in the combustion chamber whilst operating under normal load and most unfavourable operating conditions. The validation shall be to the methodology as approved through pre-operational condition PO6.	Validation tests completed before the end of commissioning
	The operator shall submit a written report to the Environment Agency on the validation of residence time, oxygen and temperature whilst operating under normal load, minimum turn down and overload conditions.	Report submitted within 2 months of the completion of

Table S1.3 Improvement programme requirements		
Ref	**Requirement**	**Date**
	The report shall identify the process controls used to ensure residence time and temperature requirements are complied with during operation of the RTO.	commissioning
IC4	Impact of metal emissions to air The operator shall carry out an assessment of the impact of emissions to air of the following component metals subject to emission limit values: Cd, As, Pb and Ni. A report on the assessment shall be made to the Environment Agency. Emissions monitoring data obtained during the first year of operation shall be used to compare the actual emissions with those assumed in the impact assessment submitted with the Application. An assessment shall be made of the impact of each metal against the relevant Environmental Standard (ES). In the event that the assessment shows that an ES can be exceeded, the report shall include proposals for further investigative work.	15 months from the completion of commissioning
IC5	CEMs performance The operator shall submit a written summary report to the Environment Agency to confirm that the performance of Continuous Emission Monitors (CEMs) for parameters as specified in tables S3.1 and S3.1(a) of this permit comply with the requirements of EN 14181, specifically the requirements of QAL1, QAL2 and QAL3. The report shall include the results of calibration and verification testing,	Initial calibration report to be submitted within 3 months from the completion of commissioning Full summary evidence compliance report to be submitted within 18 months from the completion of commissioning
IC6	Monitoring location compliance During commissioning, the operator shall carry out tests to assess whether the air monitoring location at emission point A1 meets the requirements of BS EN 15259 and supporting Method Implementation Document (MID).	Report to be submitted within 3 months from the completion of commissioning

Table S1.3 Improvement programme requirements		
Ref	**Requirement**	**Date**
	A written report shall be submitted for approval setting out the results and conclusions of the assessment including where necessary proposals for improvements to meet the requirements. The report shall specify the design of the ports for particulate sampling. Where notified in writing by the Environment Agency that the requirements are not met, the operator shall submit proposals or further proposals for rectifying this in accordance with the time scale in the notification. The proposals shall be implemented in accordance with the Environment Agency's written approval.	
IC7	<u>Refining of Mineral Oil and Gas BAT Conclusion 52</u> The operator shall develop a monitoring programme for measuring point source emissions of non-methane volatile organic compounds (NMVOCs) and benzene from the loading and unloading of liquid hydrocarbons at emission point A4, as specified in BAT Conclusion 52. The monitoring programme and associated methodologies shall be approved in writing with the Environment Agency having regard to the requirements set out in the Refining of Mineral Oil and Gas BAT Conclusions and the Environment Agency web guide on Monitoring stack emissions for environmental permits (formerly part of M2) (found on www.gov.uk).	Monitoring programme to be submitted within 3 months from the completion of commissioning
IC8	<u>Dioxin and dioxin like PCB monitoring</u> The operator shall carry out a programme of dioxin and dioxin like PCB monitoring over a period and frequency agreed with the Environment Agency. The operator shall submit a report to the Environment Agency with an analysis of whether dioxin emissions can be considered to be stable.	Within 6 months of completion of commissioning or as agreed in writing with the Environment Agency

ANNEX 4: Consultation Reponses

A) Advertising and Consultation on the Application

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

The Application was advertised on the Environment Agency website and was made available to view at the Environment Public Register.

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

- UK Health Security Agency (UK HSA)
- Director of Public Health
- Food Standards Agency (FSA)
- Marine consents
- Health & Safety Executive (HSE)
- Local authority
- Fire Safety
- Port of Sunderland

Consultation Responses from Statutory and Non-Statutory Bodies

Responses Received from **UK Health Security Agency**, Environmental Public Health Scientist, dated 27 September 2022 and 18 May 2023	
Brief summary of issues raised:	Summary of action taken / how this has been covered
No issues raised	No action required

Representations from other Organisations

Representations were received from Circtec Limited, who raised the following issues:

- That the only BREF which has been considered for most emission limit values (ELVs) is the BREF for the refining of mineral oil and gas and that the Waste Incineration BREF is the most relevant when considering the burning of the syngas and setting ELVs.
- That it does not appear that any consideration has been given to whether the IED Annex VI ELVs are BAT for the Installation or whether the obligation to minimise emissions has been considered.

- Tabulated ELVs were provided to compare their recently permitted waste rubber pyrolysis plant in the Netherlands (project name Verda) against this Installation. Their plant is subject to the lower waste incineration BREF ELVs, whilst it would appear that we consider the IED Annex VI ELVs to be BAT for this Installation.
- That no ELV is proposed for dioxin-like PCBs, despite there being a limit set by the incineration BREF.
- That as part of the Trade and Cooperation Agreement (TCA) between the UK and the EU, we should not weaken environmental standards and that operators in a particular industry meet common set standards.
- That if we grant this Permit without proper recourse to the waste incineration BREF and without a proper assessment of what is BAT in terms of emissions to air, this will have a serious impact on their business.
- Based on the above, that they would expect us to issue a 'minded to grant' decision to understand our decision making.
- That they are applying for a permit as a Section 1.2 Part A(1)(f) activity when it is clearly a waste incineration plant and this activity excludes waste incineration.
- That section 2.3.4 of the incineration BREF refers to the pyrolysis of waste tyres. It gives an example of pyrolysis in a rotary kiln, followed by condensation of the gaseous tars and oils and high temperature combustion of the pyrolysis gas, consistent with the process in the Application.
- That there is no explanation provided as to why the incineration BREF wasn't considered.
- That if we proceed to grant a permit without proper regard to the incineration BREF and BAT Conclusions, that not only is this an incorrect legal assessment, but it will undermine the basis on which waste gasification and pyrolysis plants have been permitted in the UK. Any such decision has the potential to impact all waste incineration plants in the UK and potentially undermine the entire sector.
- That the output of the Installation by weight, based upon typical outputs of a pyrolysis process, is circa 40/45% carbon powder (rCB). This is effectively a recycled chemical product and as such the relevant chemicals sector BREF should apply.

Our explanation of the legislative requirements for the Installation are set out in section 4, Annex 1A and Annex 1B of this document.

Following our pre-application advice, the Applicant applied for an activity falling under Section 1.2 Part A(1)(f)(iv) of the EPR and we do not consider there is any need to reconsider that advice. The only other possible alternative activity would be under Section 5.1 for the incineration of waste. As the Installation can achieve the relevant BAT AELs) for Section 5.1, we have as part of our obligation to achieve a high level of protection for the environment, exercised our discretion to impose these, refer to section 6.5.1 of this document.

Our explanation of settling ELVs is set out in sections 6.1 and 6.5 of this document.

Consultation requirements are set out in sections 2.2, 7.1 and Annex 4 of this document.