Permitting Decisions- Variation

We have decided to grant the variation for Immingham Briquetting Works operated by CPL Products Limited.

The variation number is EPR/DP3134LK/V009.

The variation was issued on 23/12/2024.

This variation allows for the addition of a pyrolysis plant to process biomass into a bio-stable char, with an associated emission point to air. There are no additional emission point to water as a result of this variation.

The pyrolysis plant is permitted under Section 1.2A(1)(f) - pyrolysis, carbonisation, distillation or partial oxidation of carbonaceous material not undertaken on an oil refinery.

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

Purpose of this document

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

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

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

Read the permitting decisions in conjunction with the environmental permit and the variation notice.

Key issues of the decision

1. **Addition of Schedule Activity**

2. **Best available technique**

3. **Impacts from emissions released to air**

Addition of new Scheduled Activity

Description of new Scheduled Activity

This variation allows for the addition of a pyrolysis plant to process biomass into a bio-stable char, with an associated emission point to air.

The pyrolysis plant is permitted under *Section 1.2A(1)(f) - pyrolysis, carbonisation, distillation or partial oxidation of carbonaceous material not undertaken on an oil refinery*.

The process is to pyrolyse waste wood and other biomass input materials by heating in an oxygen depleted atmosphere to produce char. The finished product is a stable char containing the majority of the fixed carbon from the input material.

The process is divided into three sections; receipt/storage of input materials , drying and pyrolysis. Each process can be run independently from one another.

The input raw material will be delivered into concrete storage bays on an impermeable surface. The input materials will be selected to have an appropriate moisture content to be non-dusting and low-odour. The input materials will enter the process building via an inclined conveyor fed by mobile plant which delivers directly to the feed hopper of the extruder. The extruder is a proprietary extrusion press which forms the material into a small pellet. Should the input material require drying prior to pyrolisation, it will be transferred by mobile plant from the in-process storage bay and delivered into an airlocked infeed hopper through into the dryer. The dryer will be heated either by a direct fired natural gas burner and/or by hot air (combustion gases) from the pyrolysis kiln process. The design is to reduce the moisture level to 10-15% (i.e. not fully dry) as a precursor to the material being processed through the pyrolysis kiln. The combustion gases/hot air then pass through a cyclonic separator to remove any entrained particles from the drying process and then exit via the plant stack.

The hot air stream is created by diluting combustion exhaust gases from the pyrolysis kiln thermal oxidiser with air to produce a temperature controlled hot gas. This reuses heat to increase the efficiency of the process. Any solids recovered from the cyclonic separator are contained in a suitable flexible container and reprocessed in the extruder as required.

The pyrolysis kiln is indirectly fired by natural gas. Input material is fed into an airlocked infeed hopper from the appropriate in-process bay by mobile plant. The kiln is then screw fed into the slow rotating inner chamber. Here the temperature is increased to 650 – 750 centigrade over the length of the kiln heating tube. Under these conditions in the absence of air the biomass is decarbonised by the release of a mix of hydrocarbons as a highly calorific gas. The remaining solid is a stable biochar which is discharged via a series of enclosed cooling screws into a sealed flexible container.

Gases from the pyrolysis are fed to a thermal oxidiser for combustion, the combustion is self-sustaining by using the waste heat from the thermal oxidiser but has a natural gas burner which initiates the combustion and acts as a pilot flame to ensure the oxidation is complete. The exhaust gases are then passed through the dryer and into the main stack.

Impacts from emissions released to air

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'.

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.

In this case, the applicant has undertaken the more accurate method for calculation of process contributions of "air dispersion modelling", which take into account relevant parameters of the release and surrounding conditions, including local meteorology.

Air dispersion modelling enables the process contribution to be predicted at any environmental receptor that might be impacted by the plant. Once short-term and long-term PCs have been calculated in this way, they are compared with Environmental Standards (ES).

PCs are considered **Insignificant** if:

- the **long-term** process contribution is less than **1%** of the relevant ES; and
- the **short-term** process contribution is less than **10%** of the relevant ES.
  The **long term** 1% process contribution insignificance threshold is based on the judgements that:
  - *It is unlikely that an emission at this level will make a significant contribution to air quality;*

- *The threshold provides a substantial safety margin to protect health and the environment.*

- The **short term** 10% process contribution insignificance threshold is based on the judgements that:
  - *spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions;*
  - *the threshold provides a substantial safety margin to protect health and the environment.*

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

For those pollutants which do not screen out as insignificant, we determine whether exceedences of the relevant Environmental Standard (ES) are likely by adding the Process Contribution to the Background concentration to Predicted Environmental Concentration (PEC). 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 value is identified, we may require the applicant to go beyond what would normally be considered BAT for the Installation or we may refuse the application if the applicant is unable to provide suitable proposals. Whether or not exceedences are considered likely, the application is subject to the requirement to operate in accordance with BAT.

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

If, as a result of reviewing 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.

Assessment of impacts on human health, Nature conservation, landscape, heritage and protected species and habitat designations

Ecological receptors

We have checked the location of the application to assess if it is within the screening distances we consider relevant for impacts on nature conservation, landscape, heritage and protected species and habitat designations. The application is within our screening distances for these designations:

- Humber Estuary - 2000480 SSSI

- Humber Estuary Ramsar, SAC, SPA
- Homestead Park Pond LWS
- Rosper Road Pool LWS

Human Health receptors

Human health receptors have been identified by the operator and have been considered as part of our audit.

H1 screening

The operator carried out an initial screening of emissions to air using the EA risk assessment H1 software tool as part of the EA guidance; Air Emissions Risk (AER) assessment for your environmental permit. For those operational emissions not screened out by the H1 assessment as being either insignificant or not significant, detailed dispersion modelling is required to determine their significance more precisely.

The H1 assessment concluded the need for dispersion modelling of nitrogen oxides, sulphur dioxide and particulate matter emissions from the new plant to assess the impacts more precisely from activities on sensitive human and ecological receptors located around the Site.

Further assessment

The applicant provided an Air Quality Impact Assessment, which considered emissions for all in-use existing emissions (A2, A4, A5, A6 and A7). They also considered emissions from A8, A9 and A10 which are the emission points associated with a pilot plant present on-site which does not currently have any emission limits or monitoring requirements associated with it.

The addition of this pilot plant is currently going through determination as part of a separate variation application (EPR/DP3134LK/V008)

Despite this variation (V009) not adding emission points A8, A9 and A10, they have been included in the operator's air quality assessment, and our own checks of the conclusions of the assessment, in order to present a worst-case scenario.

The operator's air quality assessment does not include emissions from A1. This is because the activity associated with this emission point (MHT1) is not in use. This variation will prevent the operation of MHT1. See the pre-operational condition section for more detail.

In order to ensure that the conclusions of the operator's air quality assessment remain valid, we have added a pre-operational condition for future development to the permit, requiring the operator to submit a new air quality assessment including all emissions point, inclusive of A1, if they wish to operate MHT and emit from A1 in the future.

The operator's air quality assessment used actual emissions data in order to inform its modelling and therefore conclusions.

The operator concluded that impacts when assessed against all long term and short-term human and ecological ES and all ecological critical levels and loads arising from the modelled pollutants to be not significant. However, as a result of the operator using actual emissions data rather than emissions at the Emission Limit Values (ELVs) present in the permit, it was necessary for us to carry out our own sensitivity analysis, scaling the actual emissions provided by the operator to the ELVs. This approach would present a worst-case scenario and be able to form the basis of our decision-making.

Following our sensitivity checks, we agree with the operator that there are unlikely to be any exceedances of the EAS of any of the modelled pollutants at either human health or ecological receptors. Our conclusions are summarised below:

Human Health Receptors

- The operator's maximum predicted process contributions (PCs) at human health receptors are insignificant against the relevant environmental standards (ES).
- The PCs and predicted environmental concentrations (PECs) are presented in Tables 5.2 to 5.6 of the AQA report (titled: Coal Products Limited, Immingham Briquetting Works – Environmental Permit Application, Appendix B – Air Quality Impact Assessment, December 2023).
- We have scaled the operator's PCs up to ELVs and the proposed ELVs for the current Pilot plant and the new Biochar activity. Our checks indicated that the scaled PCs at human health receptors are all insignificant against the relevant ES.

Ecological Sites

- The operator has assessed ecological sites within the relevant screening distances of 10 km for European sites and 2 km for Sites of Special Scientific Interest (SSSI) and local nature sites. They have identified three ecological sites within the screening distances.
- The operator's maximum predicted annual oxides of nitrogen (NO_X), daily NO_X and annual sulphur dioxide (SO_2) PCs are insignificant against the relevant critical levels (Tables 5.7 and 5.8 of the AQA report).
- The operator's maximum predicted nutrient nitrogen deposition and acid deposition PCs are insignificant against the relevant critical loads (Tables 5.9 and 5.10 of the AQA report).
- We scaled the operator's PCs up to ELVs where necessary and the proposed ELVs for the current Pilot plant and Biochar activity.
  Our checks indicated that:
    - Scaled annual SO_2 and acid deposition PCs at the maximum impacted receptors of the Humber Estuary Special Area of

Conservation (SAC), Special Protection Area (SPA), Ramsar and SSSI are 'not insignificant', however, predicted environmental concentrations (PECs) are unlikely to exceed the relevant critical level and critical loads respectively.
    - Scaled annual NO_X, daily NO_X and nutrient nitrogen deposition PCs are insignificant against the relevant critical levels and critical loads respectively.

With regard to ecological sites, we have not consulted Natural England, we sent notification to them of our decision for information only, as we have carried out our own sensitivity analysis to confirm that:

1. The impacts from the Biochar activity, in isolation, screen out as insignificant for all pollutants.
2. The impacts that do not screen out as insignificant across all emission points on site (SO_2 and acid deposition) reduce when the removal of the mild heat treatment 1 activity and the addition of the Biochar activity is considered.

We used some data from the 2018 Air Quality Assessment, which accompanied variation application EPR/DP3134LK/V006, to calculate what emissions were associated with the whole facility including the now not-to-be used MHT 1 activity and the associated A1 emission point vs the rest of the facility permitted by V006 plus the new air emissions associated with the Pilot Plant (which is being assessed under permit application EPR/DP3134LK/V008) and the Biochar activity.

Our sensitivity checks indicate:

- The operator modelled at the ELVs in the 2018 AQA report (rather than monitored concentrations, like in the December 2023 AQA report).
- At ecological receptors, the maximum annual SO_2 PC is 1.1 µg/m^3 (Table 5.18 of the 2018 AQA report).
- At ecological receptors, the maximum acid deposition PC is 0.102 keq/ha/yr (sum of N and S contributions in Tables 5.20 and 5.21 of the 2018 AQA report).

In the AQA report submitted with this variation V009 (dated Dec 23), the operator's maximum predicted:

- SO_2 PC is 0.02 µg/m^3. When scaled to the ELV, the operator's maximum SO_2 PC would be around 0.2 µg/m^3. This is a decrease of around 0.9 µg/m^3 compared to the 2018 AQA report.

- Acid deposition PC is 0.0033 (kg N+S/ha/yr, modelled at monitored SO_2 concentrations). When scaled to the ELV, the consultant's acid deposition PC would be around 0.03 keq/ha/yr. This is a decrease of around 0.7 keq/ha/yr compared to the 2018 report.

As the permitted SO_2 ELV for A1 (which will no longer be emitting) is 300 mg/Nm^3 , the proposed SO_2 ELV for the new source A11 is 50 mg/Nm^3, and assuming SO_2 ELVs and stack parameters for all other sources are unchanged, we would expect SO_2 emissions from the site to decrease overall, as reflected in the annual SO_2 PCs noted above. As a result, we believe that removal of the MHT1 emission point A1 and implementation of the emission points associated with the Pilot Plant (which is being assessed under permit application EPR/DP3134LK/V008) and Biochar Activity is a betterment for impacts of SO_2.

We determine that he impacts of the air quality emissions resulting from this variation are insignificant because:

1. When considered in isolation, the emissions from the biochar activity screen out as insignificant for all pollutants.
2. All previously assessed air quality emissions from the site have been determined to be BAT.
3. The addition of the biochar activity and the removal from operation of MHT1 emission point A1 is an environmental betterment.

The decision was taken in accordance with our guidance.

Decision considerations

Confidential information

A claim for commercial or industrial confidentiality has not been made.

Identifying confidential information

We have not identified information provided as part of the application that we consider to be confidential.

The decision was taken in accordance with our guidance on confidentiality.

Consultation

The consultation requirements were identified in accordance with the Environmental Permitting (England and Wales) Regulations (2016) and our public participation statement.

The application was publicised on the GOV.UK website.

We consulted the following organisations:

- UKHSA
- Local Authority Environmental Protection
- Local Authority Planning
- HSE

The comments and our responses are summarised in the consultation responses section.

The regulated facility

We considered the extent and nature of the facility at the site in accordance with RGN2 'Understanding the meaning of regulated facility' and Appendix 2 of RGN2 'Defining the scope of the installation'

The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.

The new activity is presented in more detail in the Key Issues section above.

The site

The operator has provided a plan which we consider to be satisfactory.

This shows the extent of the site of the facility including the discharge points

The plan is included in the permit.

Site condition report

The variation application has not changed the facility's site condition report.

Environmental risk

We have reviewed the operator's assessment of the environmental risk from the facility.

The operator's risk assessment is satisfactory.

General operating techniques

We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility.

The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit.

BAT Assessment

The operator stated that the Pyrolysis plant process is an example of a new process/technology. However, a comparison against indicative BAT has been provided by the operator, evaluating the environmental management techniques to be implemented against those given in the addendum "Treating Waste by Thermal Desorption" to Environment Agency Guidance Note EPR 5.06.

The operator’s assessment is shown in the table below, where no comments have been made, we have accepted the operator’s assessment of BAT. We have made comments where necessary in order to describe our reasoning behind acceptance as BAT, in *italics* :

Item	BAT	Description of BAT	Description of Proposed Facilities
Waste Characterisation			
1	1	The technical capability of a facility must be pre-determined in terms of the nature and quantities of waste materials that can be treated at the facility, taking into account the available pre-treatment provisions, storage capacity and infrastructure, treatment capability and capacity, material handling provisions, and effectiveness of the off-gas treatment systems.	The proposed plant has been designed based upon the operator's knowledge of the specification of incoming non-hazardous biomass, the contaminants requiring removal and the applications of resulting biochar. This is supplemented by existing infrastructures and operations
2	2	The facility must have clearly defined acceptance and rejection criteria for waste that can be safely stored on-site and treated by the thermal desorption process, including consideration of factors such as: ▪ Concentration, boiling point and flash point of volatile organic contaminants ▪ Water content, pH and physical characteristics of waste material	The composition and physical characteristics of the wastes to be processed at the facility is restricted to the EWC Codes within the current permit, as listed in Table S2.3. *A pre-operational condition (PO2) Has been added to the permit requiring the operator to detail, and gain approval to,*

		▪ Presence of inorganic contaminants, chlorinated compounds and odorous materials	*waste acceptance and waste acceptance procedures to be used at the site*
3	3	A system should be in place to inform customers and site operatives of the type of waste that the facility is permitted to accept for storage and/or treatment, specifically considering the nature and quantity of the material and its contaminants (organic and inorganic, volatile and non-volatile)	The proposed plant will process a limited number of sustainable biomasses into a bio-stable char. The site personnel are already familiar with these materials through our pilot HTC unit where these materials were tested following permission from the Environment Agency. The finished product will be made available for analysis and testing by our academic partner Nottingham University to demonstrate stability, structure and chemical composition. The remaining products will be used as a soil improver, fossil carbon replacement in fuel or as a precursor material for activated carbon.
4	4	Waste should only be accepted for treatment if the material and its contaminants can be effectively treated by the thermal desorption process. Waste materials that do not contain contaminants that will be effectively treated (i.e. desorbed during treatment) should not be accepted for treatment in isolation or in combination with other wastes, unless the contaminants	Only sustainable biomasses and non-hazardous waste that can be processed by the proposed plant will be accepted and processed on site.

		are below relevant hazardous waste thresholds and it is demonstrated that they will assist the treatment process.	
5	5	Representative samples must be taken and analysed in order to characterise the waste material and identify contaminants. The samples collected need to be as fully representative of the whole to be characterised as possible. Sample size and number should be large enough to adequately represent the range of waste characteristics and contaminants contained in the waste material. Waste materials that are not known to be homogenous may need to be pre-treated or sampled in a way that ensures variability is taken into account, for example, by pre-mixing the waste before sampling or by using a coring tool.	The non-hazardous biomass is supplied from known sources (i.e. treatment processes) which characterise the waste material and identify its contaminants. Waste will be transferred via bulk tipper and transported directly from known sources to the facility at Immingham. Source identity will be maintained throughout the process.
6	6	Sampling highly volatile organics may require the use of specialised sampling techniques and equipment to ensure that, as far as possible, the volatile substances are not lost from the sample. Where necessary, precautions should be taken to ensure that, as far as possible, the samples do not undergo any changes before analysis. The container holding the sample should be securely sealed to prevent the loss or separation of volatile components (e.g. moisture or solvents) between the time of sample collection and analysis.	The proposed facility will not be used for the treatment of highly volatile organic wastes.
7	7	Lab-scale studies should be carried out to characterise and quantify the separate solid, oil/solvent and water fractions of the waste material, for example using retort apparatus.	The proposed facility will only treat non-hazardous biomass from known sources and of known composition. It is not

8	8	Waste samples should be taken and analysed for a full range of contaminants,(organic/inorganic, volatile/non-volatile) for example: ▪ BTEX compounds (benzene, toluene, ethylbenzene and xylenes), ▪ Total and speciated hydrocarbons, ▪ Metals (e.g. arsenic, cadmium, chromium, copper, lead, mercury and nickel) ▪ Base/Neutral/Acid compounds ▪ Polycyclic aromatic hydrocarbons ▪ Halogenated compounds (e.g. PCBs or compounds containing chlorine)	proposed to undertake additional laboratory scale studies. These materials have already been processed through our existing HTC unit under the supervision of the local Environment Agency inspector.
9	9	The characterised waste should be assessed (for example, through documented literature studies, lab-scale tests, trials) to confirm whether or not it is suitable for storage and treatment by thermal desorption and to identify any potentially problematic contaminants. If confirmed suitable, treatment criteria required should be determined (i.e. in terms of pre-treatment requirement, treatment temperature and duration) to ensure that the waste will be fully treated and that the process is operated in an efficient and safe manner	
10	10	Wastes containing PCBs and other chlorinated substances should only be accepted for treatment by thermal desorption if specific measures are in place in order to prevent the release of PCBs to atmosphere and the formation and release of dioxins and furans.	Not applicable for the pyrolysis plant. All process gases are directed to the thermal oxidizer. The thermal oxidizer has been designed to maintain a temperature of 850°C in the presence of at least 15% v/v oxygen, dry gas to ensure complete oxidation of compounds.
11	11	Waste samples should also be analysed for a full range of inorganic contaminants, which may remain in the waste material	The proposed facility will only treat non-hazardous biomass from known sources

		following thermal treatment or become volatised during the treatment process (e.g. for volatile metals such as mercury).	and of known composition and that have been previously processed on the site for other processes. It is not proposed to undertake additional laboratory scale studies.
12	12	Where significant concentrations of volatile metals are detected in a sample the corresponding waste material should only accepted for treatment by the thermal desorption unit if the treatment temperature will be sufficiently below the boiling point of the metal (in order to prevent evaporation of the metal), unless it has been assessed that the metal will not cause unacceptable contamination of the condensate and suitable off-gas abatement systems are in place, which will ensure that any volatilised metals are fully removed from the gas before it is discharged to atmosphere.	
13	13	Untreated and treated waste material should be held in contained (bunded/kerbed) storage areas that are provided with impermeable hardstanding and sealed drainage designed to collect any liquids released from the waste material during storage. Waste material should be stored undercover or in covered containers to prevent the generation of contaminated surface waters / leachate and fugitive emissions to air and water (including dust)	Waste will be received in bulk tipper and be stored on the impermeable concrete floor which is presently uncovered. Any water runoff is captured and returned to the site effluent systems. Concrete walls will ensure the majority of runoff is prevented.
14	14	Waste storage areas should be provided with adequate ventilation and, where necessary, air extraction systems with abatement. Specifically, if untreated waste is stored in a confined/sheltered location, consideration should be given to the potential generation and accumulation of volatile gases and the formation of potentially flammable/hazardous atmospheres	It is proposed the waste will be stored outside, however the building is also ventilated and designed with respect to the storage of non-hazardous biomass

15	15	As far as it is practical to do so, organic and inorganic hazardous wastes and wastes that contain different contaminants that are at concentrations above the Hazardous Waste thresholds and will not be (or have not been) fully treated by the thermal desorption process should be stored, handled and treated separately. There are a number of reasons for this including: ▪ both the hazardous waste strategy and hazardous waste hierarchy guidance documents require that inorganic and organic wastes should be kept separate; ▪ treatment by dilution is not acceptable; and ▪ the recovery of treated materials may be compromised. Where mixing of wastes is required (e.g. for pre-treatment or co-treatment purposes) there must be a recorded assessment of the mixing process, which explains why it is necessary and demonstrates that the wastes are compatible, that dilution would not be used to change the classification of the waste (i.e. from hazardous to non-hazardous) and that the quality of the treated waste material would not be negatively affected.	A range of hazardous (i.e. activated carbon wastes that have an absolute entry in the EWC) and non-hazardous wastes are treated at the facility. All deliveries report to a single manned weighbridge immediately on arrival where the material details and weights are recorded. The drivers are then advised to where to go on site and in all cases are met by an employee prior to unloading to ensure the incoming load is correct and the unloading is recorded. Waste will be held in a quarantine area of the warehouse until the material has been correctly identified and the waste transfer notes / consignment notes verified. Hazardous and non-hazardous waste will be segregated during storage and handling.
16	16	Potentially dusty materials (e.g. treated/dried waste) should remain covered/contained at all times, provided with wind protection and, where necessary, water spray should be used to prevent dust generation. However, the application of water should be controlled in order to prevent the leaching or dilution of contaminants and surface run-off. Further treatment of recovered water may be necessary prior to its application as a dust control measure due to potentially odorous characteristics of recovered water	The raw materials proposed are stored loose externally, however it is wet and therefore non-dusty. Additional water sprays are not required for the containment of dust. All processing will be carried out within the building.

17	17	Individual storage tanks/vessels or bays should be provided in order to: ▪ separate batches of untreated and treated waste and avoid cross-contamination; ▪ separate batches of wastes that contain different contaminants, unless they are being treated together (subject to point 3 above); and ▪ isolate treated batches of waste if they contain high concentrations of a specific substance for recovery – e.g. if a high metal waste is received.	Not considered applicable; the waste is stored externally. Material will be sourced in batches and there will be no mixing of batches. All of one material batch will be used prior to delivery of a different material. Throughput is low so the logistics are easily managed.
18	18	The separate storage areas and bays provided in accordance with point 5 above should be so the logistics are easily managed. physically contained and segregated from each other and provided with separate sealed drainage systems	
19	19	At sites where waste material may require pre-treatment (i.e. to improve its handling or treatment), adequate storage infrastructure and capacity should be available at the installation to allow for the storage of waste material before and after pre-treatment, whilst preventing cross contamination of batches and fugitive emissions to air, land and water.	
20	20	The selection of appropriate waste handling and conveyance systems should take into account the physical form/nature of the waste that will be accepted for treatment at the facility and of the material following treatment (i.e. taking into account how factors such as material moisture content, abrasiveness, plasticity and particle size may affect ease of handling), to ensure that they are capable of transporting it in an efficient and reliable manner. For example, screw conveyors may be more appropriate for wastes that are high in moisture than belt-conveyors, which may	

		be better suited to dry materials, and grabs may be more appropriate for handling highly abrasive waste materials.	
21	21	Waste conveyance systems should be contained in order to prevent the generation of fugitive emissions (e.g. dust, steam), loss of material/spillage and odour. Where use can be justified, machinery (tractors / loading shovels) must be fit for purpose and regularly inspected and maintained.	The biochar will be transported via an enclosed mechanical conveyor. All the conveyor systems on site are enclosed.
22	22	Adequate vehicular access should be provided where required, providing clearly marked routes for vehicle movements, which are kept clear of waste material and free from obstacles, surface water drainage systems and unprotected pipework. Measures should be provided to protect plant, buildings and storage infrastructure from vehicle movements (driving and lifting actions), i.e. through the provision of bollards, signs, adequate clearance.	A yard area of impermeable concrete construction and has been specifically designed to handle material from bulk tippers.
23	23	Internal and external operational areas should be well lit to minimise the risk of spillage and to ease detection and clean-up of any dropped material.	The proposed facility will be provided with adequate lighting.
24	24	Treated material should be allowed to cool sufficiently before it is removed from the treatment plant and transported to a storage/disposal area. Systems used to handle, transfer and hold the treated material whilst it is cooling should be designed to minimise the double-handling of material and prevent potential fugitive emissions (e.g. of dust, steam and any residual volatile odorous compounds that may be released whilst the	All products will leave the process building in large enclosed bags for storage and/or transport to other processing areas onsite or sale.

		material is still hot), preferably using an enclosed system that is integral to the treatment plant.	
25	25	Liquid residues recovered from the treatment process should be held in appropriate tanks/bulk storage vessels resistant to the material being stored, provided with appropriate containment measures (i.e. fully bunded and located on an impervious surface) and high level alarms. The vents on tanks that contain potentially volatile liquids (i.e. recovered oils and solvents) should be linked to suitable scrubbing and abatement systems. Tanks used for the storage of recovered liquids should also meet the requirements set out in PPG2 and HSG176, as appropriate	No liquid residue is expected from the proposed process.
26	26	Where necessary, compatibility testing must be carried out and recorded before different batches of wastes or collected residues are bulked up.	Not applicable
27	27	Where it is assessed that there is the potential for cross-contamination of material or possible waste compatibility issues (e.g. between treated and untreated material or between materials that contain different contaminants), measures should be in place to ensure that waste handling equipment/plant are cleaned between batches/waste streams and, where possible, separate equipment/plant should be used for handling untreated and treated material.	Not considered applicable, the plant will process specific non-hazardous biomass from known sources.
28	28	Pipework and storage tanks should be located above-ground to aid their inspection and maintenance and ensure any leakage or spillage is identified and addressed as soon as possible.	All production plant is located above ground and will be subject to a planned preventative maintenance regime. There are no surface water drains on the

			proposed site. Clean rainwater from building roof and yard areas runs-off the site to soak-away to the undeveloped land to the south.
29	29	Pipework, and associated taps, valves and pumps, should: ▪ be resistant to the liquids they carry or come into contact with; ▪ where appropriate, resistant to heat; ▪ be above ground, or if below ground in lined inspection channels, and readily available for inspection and maintenance; ▪ where appropriate, be labelled as to their contents; ▪ have the minimum number of connections; ▪ be located away from main roadways or suitably protected from impact damage; and ▪ be located on impermeable surfaces with suitable containment and segregated away from surface water drains, soakaways and sumps.	The proposed plant has been designed to be compliant with these BAT requirements.
Waste treatment			
Pre-treatment processing			
1	30	Waste materials with more consistent physical and chemical properties will generally result in more predictable and reliable waste treatment and plant operation and measures should be taken to ensure appropriate waste homogeneity prior to treatment. A variety of pre-treatment processes may be employed and some examples are provided below: a) Physical pre-treatment measures, such as crushing and screening, can be used to remove clumped masses and rocks etc., which can help improve material heat transfer during treatment and prevent jamming of feed conveyors or damage to the desorption plant. b) Fouling/plugging/caking of the plant may be prevented by pre-	Not considered applicable. The non-hazardous biomass arriving at site is a free-flowing granular material that does not require pre-treatment.

		treating waste to improve the consistency of the material (e.g. reducing its plasticity). If the material contains an excessive amount of moisture, it may require pre-treatment to reduce moisture levels and thereby aid waste handling and improve the thermal efficiency of the treatment process. Air drying, dewatering (e.g. by filter-press), and mixing with drier waste material (subject to the requirements of Point 2 below) are pre-treatment processes that may help ensure that the untreated material has the desired moisture content. c) High concentrations of volatile contaminants, such as petroleum products, can result in high waste heating values, which could potentially result in over-heating and damage to the desorption plant. Subject to the requirements of Point 2 below, waste material containing excessive concentrations of volatile contaminants are sometimes pre-treated/mixed with treated waste material or waste with lower volatile contaminant concentrations in order to reduce the concentrations to an acceptable level. d) In order to limit equipment corrosion, it may be necessary to pre-treat highly acidic waste with lime or, subject to the requirements of Point 2below, other alkaline waste, in order to maintain a more neutral pH. Similarly, a highly alkaline waste may also require pre-treatment	
2	31	Pre-mixing of waste(s) should only be carried out if it is in accordance with the requirements of Point 3, Section 3.	It is not intended to pre-mix the wastes, materials will be processed in discrete batches and not mixed.
3	32	Pre-treatment should be carried out using purpose-built plant and machinery, located in designated area(s) of the installation, provided with appropriate measures to prevent and control fugitive emissions to air, land and water, and employing	Not applicable.

		appropriate techniques to control potential noise, vibration and odour	
4	33	Following mixing, batches of mixed waste should be re-assessed to confirm: ▪ the nature and concentration of the contaminants present and the characteristics of the waste material itself (i.e. pH, moisture content), ▪ relevant treatment criteria (e.g. treatment temperature(s) and duration). ▪ Suitability of the material for treatment in the installations thermal desorption unit (and whether any further pre-treatment is required).	Not applicable.
5	34	Lab-scale bench tests and plant trials are required for each waste stream unless it is demonstrated through waste characterisation that a specific waste material has suitably comparable characteristics and contaminant compounds and concentrations to a batch of waste that has already been successfully trialled and treated using the installation’s thermal desorption plant and results of these trial and treatment cycles have been documented and are available for reference.	The proposed facility will only treat non-hazardous biomass from known sources and of known composition. The site has previously handled these materials under the control of our local Environment Agency inspector as part of our pilot plant development. It is not proposed to undertake additional laboratory scale study
6	35	The Operator should pre-determine and optimise the specific operating criteria (max / min temperature range and duration) of the treatment cycle required for fully treating the identified volatile contaminants contained in the waste material. The treatment temperature range should be determined based upon a combination of literature reviews and/or the results of previous documented treatment trials or cycles, and evaluated using a test plant that is representative of the thermal desorption unit. The results of the studies and trials used to establish and	Not applicable

		confirm the treatment temperatures should be recorded and kept for future reference.	
7	36	The scaling of the test plant is very important, as it should ensure that conditions are representative of, and replicable in, the installation's thermal desorption unit. The temperature profile of a smaller test plant will be significantly different from that of a full-scale treatment plant unless the amount of material used in the test plant and the heating process is scaled to reflect variation in the heat transfer properties of the two plant. For example, typically, the smaller test plant will require a higher fill fraction than the full-scale plant if the heating process is to be representative.	
8	37	If the thermal desorption unit is designed to operate under vacuum or negative pressure conditions a boiling point calculator can be used to take into account the effect of pressure on the heating temperature required to volatilise the identified contaminants during the treatment cycle	
Treatment			
1	38	Treatment process parameters should be tailored to the specific properties and contaminants of the waste material; therefore, the thermal desorption unit will require an appropriate level of system flexibility if potentially variable waste materials are to be treated. The treatment cycle should be operated in accordance with the optimum operating criteria (e.g. for maximum and minimum temperature range, waste feed rate and residence	Plant operating conditions will be optimised by the plant designer/manufacturer during commissioning trials. The site has been pyrolising various sustainable biomasses and biomass wastes for 10 years using a 50kg pilot scale kiln and oxidizer of the same design as the kiln in this application. In addition the existing spent

		time and air flow) determined by waste-specific studies and trials.	activated carbons kilns and oxidisers are of the same design and have been operated over the last 6 years on various wastes. This gives CPL the confidence that this new facility will perform as per the indicated emission levels.
2	39	As far as possible and practical to do so, the thermal treatment process should be carried out in a sealed chamber in order to minimise air ingress and to prevent the release of fugitive emissions. Vacuum or low oxygen conditions (e.g. using steam or a nitrogen sweep gas) should be maintained to help prevent combustion of the waste material or volatile off-gases. Due to the nature of their operation, the treatment chambers of continuous feed units do not operate as closed systems and measures should be implemented to minimise air ingress, for example by having an automated damper arrangement on the waste charging system (e.g. on the waste delivery hopper or chute) and/or by using the waste material in the charging/outlet system to form a seal. To maintain a high level of control over air ingress in such a system it is important that waste input is continuously monitored and controlled in order to provide a consistent and continuous feed level.	The rotary kiln and thermal oxidiser process for the Pyrolysis plant are fitted with the industry standard seals to minimise air ingress and release of fugitive emissions.
3	40	The thermal treatment process should subject the waste to a gradual or staged heating process. Employing low heating rates will help to avoid significant chemical changes to the waste material whilst promoting the evaporation and recovery of the full range of identified contaminants (ranging from those with the lowest boiling point to those with the highest) and avoiding the combustion of those with the highest volatility. Initially, the waste	The process involves a three staged heating process from the agglomeration where the input material is processed into pellets through heating up to 100^{o}C. The drying stage is designed to reduce the moisture level to 10-15% this is at around 350oC and then finally the pyrolysis

		will heat up to a lower temperature (e.g. 90-100°C) at which the water content of the material will be evaporated, before heating to higher temperatures required to volatilise the identified contaminants (e.g. oil-based contaminants will start to be volatilised as the temperature of the waste reaches approximately 200°C)	process the temperature is increased to 650 – 750oC.
4	41	A process for mixing the waste in the treatment chamber will aid the transfer and distribution of heat within the waste material, helping to ensure even and consistent treatment, and the release of the desorbed gases. Mixing processes may also help to break up clumps of solid material in the treatment chamber and prevent the settlement/stratification of the waste and the potential formation of pockets of trapped gases. This is particularly relevant to oven-type TDU's, where the waste may remain in the treatment chamber for long periods of time, possibly in excess of 24 hours. The treatment chambers of rotary kiln TDU's are usually provided with helical flights, which help to mix and move the waste material through the treatment chamber, and oven-type TDUs are often provided with internal paddles or stirrers.	As part of the drying process, the combustion gases/hot air then pass through a cyclonic separator to remove any entrained particles from the drying process and then exit via the plant stack. Any solids recovered from the cyclonic separator are contained in a suitable flexible container and reprocessed in the extruder as required. The process is self-sustaining.
5	42	A comprehensive inspection and maintenance programme is essential for maintaining system availability and efficiency, particularly if treating high molecular weight, viscous or adhesive materials. In rotary systems, it should be ensured that the material is able to move freely in the heating chamber and does not agglomerate or stick to the sides of the chamber. Oven systems should be designed so that waste material can be easily removed from the thermal desorption unit following treatment. Inspection and cleaning procedures are particularly	The plant will operate continuously to process batches of material, upon completion of batches, the plant will undergo an inspection and cleaning regime. The size of batch will vary depending on material being processed but will typically be less than 150 tonnes

		important in batch oven units where waste material may remain for a longer period of time	
6	43	Thermal desorption represents a relatively new and novel process for treating hazardous waste in the UK. Therefore it is important that appropriate systems are in place to promote and maintain technical resilience through the documentation and sharing of internal technical experience and expertise, avoiding reliance upon external expertise or the knowledge and experience of one individual.	A range of hazardous (i.e. activated carbon wastes that have an absolute entry in the EWC) and non-hazardous wastes are treated at the facility. All deliveries report to a single manned weighbridge immediately on arrival where the material details and weights are recorded. The drivers are then advised to where to go on site and in all cases are met by an employee prior to unloading to ensure the incoming load is correct and the unloading is recorded. Waste will be held in a quarantine area of the warehouse until the material has been correctly identified and the waste transfer notes / consignment notes verified. Hazardous and non-hazardous waste will be segregated during storage and handling. *No hazardous wastes will be processed by the Biochar activity. Hazardous wastes are taken for existing, already permitted activities on site.*

7	44	Appropriate automated process monitoring and control measures must be in place to ensure that the waste is heated to the requisite temperature(s), and for the required duration, to ensure the full and effective desorption of the identified volatile contaminants, whilst preventing combustion of the contaminants or waste material.	The thermal processes being used is the same presently used by the carbon regeneration processes in the existing permit. The existing thermal treatment processes underwent a comparison against indicative BAT as part of the previous permit variation.
8	45	Time-at-temperature data should be recorded for the waste material treated in the TDU, and concentrations of the target contaminants should be measured in the solid waste material both before and after treatment, using representative samples taken from the waste material to demonstrate treatment efficacy.	
9	46	Thermocouples may be installed in the TDU to allow the temperature of the solid waste material and gas streams to be measured and recorded. Where thermocouples are used, careful consideration should be paid to the temperature and conditions the probes are designed to operate under, and the number and location of the probes to ensure that the readings taken are accurate and representative	
10	47	The key operating parameters of the TDU should be automatically monitored and recorded in real-time to provide an accurate record of the completed treatment cycle and relevant operating conditions. Advanced process control and monitoring/data-logging systems should be employed at the facility (e.g. Systems that employ SCADA (supervisory control and data acquisition), PLCs (programmable logic controllers) and HMI (human machine interface)). Key operating parameters should include some or all of the following variables: ▪ treatment temperatures (e.g. of thermal oil, burner or heating element; gas	

		temperatures, solid waste temperatures); ▪ treatment chamber pressure, oxygen levels, lower explosive limit (LEL); ▪ waste residence time; ▪ kiln/chamber rotation speed; ▪ sweep gas/off-gas flow rate; ▪ thermal oxidiser/boiler temperature; ▪ condenser operating temperature and process water temperature and flow; ▪ exit temperature of solid waste, gases and liquids; ▪ flow and pH of scrubber liquor; and ▪ waste charging/discharging.	
11	48	Records should be kept documenting the effectiveness and efficiency of the thermal desorption process for treating different waste materials and different contaminants. The records should report the efficiency achieved for different components successfully desorbed from waste and also for those that have not been affected by the process. Assessment of treatment efficacy should be based upon mass balance calculations carried out for the relevant contaminants. These records should be used to feedback and inform the waste acceptance criteria for the thermal desorption process.	The biochar plant is operated in accordance with the requirements of an environmental management system (EMS) that is maintained under the site Environmental Permit.
12	49	The thermal desorption unit should be provided with automated, controlled and enclosed mechanical feed and discharge systems, interlocked with relevant parameters of plant operation to ensure that it operates safely and effectively(for example, ensuring that waste feed cannot take place unless the TDU is operating correctly, waste cannot be discharged from the unit until the treatment process has been completed and the waste has cooled sufficiently or, in the case of a continuous rotary kiln unit, the level of waste in the inlet/outlet hoppers are sufficient to prevent excessive air entering the treatment chamber).	The thermal processes being used is the same presently used by the carbon regeneration processes in the existing permit. The existing thermal treatment processes underwent a comparison against indicative BAT as part of the previous permit variation.

13	50	Automatic system alarms and/or trips should be set for relevant operating parameters such as temperature, pressure, thermal oxidiser temperature, fan/air flow failure, waste feed, scrubber failure, quench/condenser failure.	
14	51	The extraction of off-gases from the treatment chamber should be carefully designed and controlled in order to prevent and minimise carry-over of fine particulates/solids in to the off-gas. Mixing of the gas and solid material in the treatment chamber is desirable as it can aid heat distribution, however too vigorous mixing may increase the carry-over of particulates into the off-gas filtration system.	
15	52	An appropriate sweep gas (e.g. an inert or low-oxygen gas) may be used in the treatment chamber to help draw the desorbed volatile gases through to the off-gas management and abatement system. The use of a sweep gas and gas extraction should be adequately monitored and controlled in order to prevent the formation of an explosive atmosphere, keeping concentrations of volatile gases in the treatment chamber at a concentration safely below the relevant LEL if not operated in an inert or low oxygen atmosphere.	In accordance with BAT, process records are retained.
4. Post-treatment			
1	53	The off-gas management system must be designed and operated to ensure optimal recovery of the volatised organics, which should be based upon an efficient and effective method of cooling and condensing the gases. The system must have the capacity and resilience to reliably handle the potential volume of off-gas and concentrations of desorbed contaminants generated	All off gas is processed via the thermal oxidiser

		by the TDU under the full range of operating conditions, which will be determined by the characterisation and quantity of the wastes accepted for treatment.	
2	54	The performance of the system used to cool and condense the off-gases and collect the desorbed contaminants must be monitored and maintained in order to ensure it continues to operate efficiently and effectively. Systems must be in place to detect failure or loss in the efficiency/effectiveness of the system, which should be interlocked with plant operation, so that the TDU cannot operate unless the cooling system is working effectively and efficiently.	Not applicable, the off-gases are vented via a thermal oxidiser once the maximum number of cycles has been processed through the pyrolysis process.
3	55	As well as the condensable volatile contaminants, the design and operation of the off-gas management system should take into account the requirements for handling the potential volumes of water that will be desorbed from the treated waste materials. If wet wastes are treated a considerable quantity of water maybe evaporated and recovered by the thermal desorption system. The off-gas treatment system must be capable of safely and effectively managing the desorbed water along with the volatile organic contaminants.	The off-gases are vented via a thermal oxidiser once the maximum number of cycles has been processed through the pyrolysis process. The installation vents off-gases from the thermal oxidiser at an elevated temperature (typically 400°C) to ensure adequate dispersion of combustion gases and water vapour.
4	56	Following removal of the condensable fractions, the uncondensed components of the off gases and water vapour. -gases will require further abatement before the gases can be emitted to air.	

5	57	The treated material should be adequately cooled before being discharged from a contained system in order to prevent fugitive releases (e.g. steam) and to ensure the temperature of the material is safely below the auto-ignition temperature of any potential residual volatile contaminants.	Product exiting the pyrolysis process is cooled through a combination of indirect and direct cooling screwings.
6	58	Treated solid material should be representatively sampled and analysed for residual contaminants and other potential compounds of concern, including treated volatile contaminants and inorganic contaminants (e.g. heavy metals). It is important to determine the speciation of the metal contaminant, as certain compounds of the metal may be more toxic and harmful to the environment than others. If possible, sampling of the waste should be carried out before any water is added to the material.	Not applicable, the biochar is ready for further use, i.e., no longer a waste. *The operator will need to consider all product to be a waste until they have demonstrated that it meets end of waste criteria. This has been communicated to the operator.*
7	59	Post-treatment of the solid waste material typically entails water quenching in order to help cool the solid, control dust and aid handling. Water should be applied to the treated material in a gradual and controlled manner in order to achieve an appropriate consistency whilst preventing the leaching of residual contaminants and the generation of contaminated surface water. If the material is too hot the addition of water may produce significant quantities of steam, which, in an enclosed system, could result in over-pressurisation. In certain circumstances, for example when an immiscible solid is produced by the thermal desorption process (i.e. a solid that will not mix with water), it may be necessary to apply an appropriate additive to the quench water to improve the mixing process.	Not applicable.

8	60	Subsequent treatment of the thermally treated waste material on site (i.e. prior to recovery or disposal) should be carried out in accordance with the indicative BAT requirements set out in S5.06.	Not applicable, the biochar is bagged for dispatch without further treatment.
9	61	Condensed organic contaminants should be sent for further treatment and recovery as appropriate.	Not applicable, there are no condensed organic contaminants from the proposed installation.
10	62	To enhance their recovery, where possible, recovered liquids are often treated on site to separate the water and solvent/oil fractions of the condensed liquids (e.g. as a minimum using a gravity separation process). Such treatment activities should be carried out using appropriate tanks/vessels that are resistant to the material contained, fully bunded and located on an impervious surface, and provided with high level alarms. Appropriate tanks/bulk vessels should similarly be provided for the storage of the separated fractions.	Not applicable.
Emissions Control			
Point Source Emissions to Air			
1	63	Emissions to air and associated emission control measures (including stack/vent heights) should be assessed following the methodology set out in Section 4.1 of S5.06 to ensure that releases are prevented, abated and dispersed in accordance with BAT. The assessment should be used to justify whether or not abatement is required, and if required which technique(s) represents BAT for the installation, taking into account the likely	Emissions to air from the proposed installation have been assessed in accordance with Environmental Agency Air Emissions Risk (AER) assessment technical guidance. It is considered that abatement is not required on the basis that the only new emissions to air arise from the natural gas burners. The site has

		emissions, energy and raw material use, global warming potential and waste resulting from the candidate techniques.	been pyrolising various sustainable biomasses and biomass wastes for 10 years using a 50kg pilot scale kiln and oxidizer of the same design as the kiln in this application. In addition, the existing spent activated carbons kilns and oxidisers are of the same design and have been operated over the last 6 years on various wastes. This gives CPL the confidence that this new facility will perform as per the indicated emission levels *There are emissions to air which will arise from the combustion of the syngas in addition to the burning of natural gas.* *The emissions are considered BAT and therefore not in need to be abated due to insignificance of impact as discussed in the Key Issues Air quality section above.*
2	64	As a minimum, point source emissions to air should meet the Benchmark Emission Values contained in Section 3.2 of S5.06.	Not applicable.
3	65	The facility should be designed and operated to prevent and minimise the release of visible emissions, including emissions of condensed water or particulates, and odour from the process.	The facility will be operated and maintained to minimise the release of visible emissions.

4	66	The Operator should only accept wastes that contain volatile contaminants that can be treated effectively by the plant, which includes the effective removal of the contaminants from the gas stream following desorption.	Not applicable.
5	67	The Operator should fully characterise emissions to air from the TDU by carrying out VOC speciation, for a representative range of operating conditions and wastes, in order to identify and quantify chemical constituents.	Not applicable.
6	68	It is likely that low concentrations of residual uncondensed volatile compounds will remain in the off-gas following its treatment (i.e. cooling/condensing), which will require abatement prior to discharge to atmosphere. Abatement must be provided which will efficiently remove or destroy the potential pollutants (including odorous compounds) from the gas stream before it is emitted to air (e.g. destruction by oxidation/combustion or removal by carbon adsorption).	Not applicable.
7	69	The performance (i.e. destruction/removal efficiency (DRE)) of the emission abatement system should be assessed and maintained on a regular basis and key parameters that determine DRE (e.g. thermal oxidiser temperature, condenser temperature) should be monitored continuously, alarmed and, where practical, interlocked with TDU operation.	Not applicable.
8	70	The pressure within the treatment chamber and the rate that gas is drawn out of it should be managed in a way that minimises the amount of particulate material that is carried over into the off-	Not applicable.

		gas, whilst ensuring safe and effective treatment of the waste material and removal of the desorbed contaminants	
9	71	Wet scrubbers give rise to liquid effluent, which, if not recycled into the process, requires treatment and disposal. This should be considered in the environmental assessment / BAT assessment of the installation.	Not applicable.
10	72	The prevention and minimisation of emissions should be a factor in the selection of the fuels used at the facility. The use of natural gas can reduce potential emissions of particulates compared to other fuels (i.e. oil or coal).	The process is initiated using a natural gas burner; however, it is also self-sustaining with the waste heat from the oxidiser outlet also used in the drying stage. *We do not agree that the process is self-sustaining as natural gas is continually used to heat the pyrolysis kiln.* *We have added an improvement condition (IC9) requiring the operator to review energy use and explore energy efficiency improvement.*
11	73	Combustion gases should be controlled through the selection of fuel (e.g. selection of lowsulphur fuels or use of electric drives for continuous rotary systems) and the design of the combustion plant (e.g. through the use of low-NOx burners or selective catalytic reduction).	As above.
Point Source Emissions to Water			

1	74	Emissions to water and sewer from the treatment process should be minimal. Where possible, recovered water should be reused in the treatment process or other on-site processes, and condensed organic liquors should be sent for recovery (i.e. oil or solvent recovery processes).	There are no emissions to water associated with the pyrolysis process.
2	75	Potential sources of waste waters include the water fraction of collected condensate, storm pyrolysis process. water runoff, cooling water and waste stockpile leachate. All such waste waters should be collected and treated as necessary, before being either re-used or discharged.	
Fugitive Emissions to Air (Including Odour)			
1	76	Highly volatile contaminants may evaporate into the air during storage, therefore it is important that storage areas/bays holding wastes that contain such contaminants are provided with appropriate abated extractive ventilation and that containers holding such waste remain closed until the material is transferred for treatment.	The non-hazardous biomass used at the installation is not odorous (i.e. it is not sourced from facilities that would contaminate the sustainable biomasses with odorous compounds).
2	77	Waste material should be stored within suitable physical enclosures provided with appropriate dust/vapour control measures to prevent and minimise potential fugitive emissions. Dust curtains can be used to contain potential fugitive releases, preventing their release outside of the waste treatment/storage building(s).	The produced and non-hazardous biomass is stored externally and is wet and non-dusting.

3	78	Appropriate measures should be taken to prevent fugitive releases to air (e.g. dust, odour) from buildings used for the storage and treatment of waste, for example by keeping buildings under internal negative pressure and/or providing automatic shutter doors, which are kept shut when not in use.	The non-hazardous biomass is a granular material and considered unlikely to give rise to significant dust emissions.
4	79	The thermal desorption plant should be closed to prevent uncontrolled ingress of air and fugitive emissions. Operating the plant under a slight negative pressure can also help to prevent fugitive emissions, with the gases drawn to an appropriate abatement system.	Not applicable.
5	80	Post-treatment handling and cooling of the hot waste material should be carried out in process units that are fully enclosed and, where possible, integral to the TDU.	Not applicable.
6	81	If held outdoors, treated waste material should be stored under cover or in covered containers	All incoming material is stored externally, product may be stored externally in sealed FIBC (flexible intermediate bulk container).
7	82	A programme of site inspection and monitoring should be carried out to ensure that unacceptable levels of dust generated from the movement and handling of waste are not released	A site housekeeping procedure which includes visual inspections of external yard areas and internal storage areas will be implemented at the installation.
8	83	A Leak Detection and Repair (LDAR) programme should be implemented at the facility for the control of potential fugitive releases.	Given the scale and nature of the proposed activities, an LDAR programme is not considered warranted, although all

			plant and equipment will be subjected to planned maintenance and inspection.
Fugitive Emissions to Water and Land			
1	84	All waste material (treated and untreated) should be stored under cover or in covered containers, on impermeable hardstanding with sealed drainage.	All incoming material is stored externally, product may be stored externally in sealed FIBC (flexible intermediate bulk container). It is stored on impermeable hard standing with sealed drainage.
2	85	Waste material should be held in tanks, closed containers or, for solids, suitable bays, capable of holding any free liquid generated during storage, and within an area of the installation provided with appropriate secondary containment measures.	The biochar will be stored in bags after processing. The material does not give rise to free liquids.
3	86	If the waste material cannot be held in containers/skips it should be held in enclosed or shielded bays of suitable and robust construction that provide the material with adequate shelter and containment to prevent the loss of material and liquid residues.	The biochar will be stored in bags after processing.
4	87	Wherever feasible, material should be held and handled in enclosed systems.	Process contains open hoppers but material not considered dusty due to particle size.
5	88	Water used for material dampening should be applied at a controlled and calculated rate and not to an extent that could promote leaching or the generation of contaminated run-off.	Not applicable, water is not used for material damping.
Emission Monitoring Requirements			

1	89	Where continuous emission monitoring is not proposed or provided for the plant's point source emissions to air specific justification must be provided to demonstrate that the proposed measures represent BAT.	It is proposed to undertake annual emission monitoring, as per the existing installation's Environmental Permit. *We have added a requirement for quarterly monitoring and reporting in the first 12 months of operation of the Biochar activity, then resorting to annual monitoring and reporting. We determine this represents BAT given the insignificant air impact of the biochar activity.*
Process Efficiency			
Energy Efficiency			
		Energy efficiency should be considered during the selection/design and operation of the TDU. The method and plant used to heat the waste will contribute significantly to the overall energy efficiency of the facility, and different systems are likely to have different efficiencies. Only indirect heating methods should be considered.	Not applicable for this variation. However, energy efficiency (and consequent reduction in energy use) is a key benefit as it is a self-sustaining process. *We do not agree that the process is self-sustaining as natural gas is continually used to heat the pyrolysis kiln.* *We have added an improvement condition (IC9) requiring the operator to review energy use and explore energy efficiency improvement.*

		Appropriate measures should be taken to identify and optimise the treatment temperature(s) and duration of operation at the treatment temperature(s) in order to maximise the energy efficiency of the treatment process (e.g. through thorough waste characterisation, pilot trials, process monitoring and control measures).	*We have added an improvement condition (IC9) requiring the operator to review energy use and explore energy efficiency improvement.*
		It is important that the water content of the untreated waste material is assessed and, where necessary, controlled prior to treatment (i.e. through an appropriate pre-treatment process). If pre-treatment is required, a balance will usually need to be made between the energy required to reduce the moisture content of waste and the increase in the efficiency of the heating process gained from the removal of the water. It may also be advantageous to have a certain minimum amount of moisture in the untreated waste material to aid handling. The removal of volatile organic compounds can be helped by there being a moderate level of moisture in the waste material (typically between 10-20%).	*We have added an improvement condition (IC9) requiring the operator to review energy use and explore energy efficiency improvement.*
		The potential for energy recovery should be considered during the design of the TDU and reviewed on an on-going basis once operational. Potential opportunities for energy recovery include the recovery of heat from hot gases (e.g. combustion exhaust gases, thermal oxidiser gases) to pre-heat sweep gases, re-heat off-gases or reduce the water content of untreated waste.	*We have added an improvement condition (IC9) requiring the operator to review energy use and explore energy efficiency improvement.*
2. Efficient Use of Raw Materials and Water			
		Process consumption of raw materials and water should be considered during the design of the TDU and should be	Not applicable for this variation.

		reviewed on an on-going basis during operation. For example, during the comparison of waste cooling systems (requirements for use of refrigerants/coolants/treatment chemicals etc) and emission abatement systems (requirements for use of catalysts, filter material etc).	
		If carbon filters are used on-site for abatement purposes, spent activated carbon should be sent for recovery and re-use where possible.	Not applicable
		It may be possible to reuse dried treated material to condition wetter untreated material in order to improve its properties for handling and/or treatment. However, any mixing process must be carried out in a way that meets the requirements of BAT.	
		Wherever possible, cooling waters used at the facility should be re-circulated and re-used.	
		Water added to treated waste material (i.e. in order to dampen it and prevent fugitive dust emissions) must be applied in a controlled manner	
3. Waste Minimisation			
		Some of the waste streams produced by the treatment process may be suitable for recycling or reuse in the process. For example, if suitable, recovered water could be re-used on-site, primarily to suppress dust emitted from the treated waste material before or after it exits the treatment plant. Opportunities for recycling/reusing waste on-site should be considered during	There are no significant wastes arising at the installation (other the small quantities of maintenance machine oils and lubricants). The biochar product will be sent for analysis and additional product used in CPL's biomass fuel products.

		plant design, and should be reviewed on an on-going basis during plant operation.	
		The condensed desorbed contaminants should be stored on-site before being sent for further treatment and recovery (for example, as a recovered fuel oil/processed fuel oil or Cemfuel).	Not applicable, there are no condensed contaminants from the process.
		Where suitable, and appropriate measures are in place to prevent potential fugitive emissions, fine material collected from the off-gas by the particulate abatement system may be mixed with the contaminated feedstock for reprocessing/ re-conditioning.	Not applicable, the proposed installation does not require a particulate abatement system.
		Spent carbon filter material should be sent for reactivation and reuse i.e. to the original supplier or other processor.	Not applicable, the proposed installation does not use carbon filters.
		Where possible, consideration should be given to the use of processed fuel oil as a source for the heating/drive energy generation.	The process is initiated using a natural gas burner; however, it is also self-sustaining with the waste heat from the thermal oxidiser also used in the drying stage. *We do not agree that the process is self-sustaining as natural gas is continually used to heat the pyrolysis kiln.*
Accident Management			
		Process control systems should be designed to include provisions for a safe shut-down with minimum emissions (point-source and fugitive) from the plant. Measures should be in place	The proposed plant will include a PLC controlled automatic shut-down system.

		to ensure that waste feed supply is controlled or terminated, as appropriate, followed, where necessary, by a pre-programmed and automated sequence of plant shut-down, which is designed to ensure that the treatment process is controlled in a safe manner and potential emissions are minimised.	
		Where necessary, an uninterrupted power supply should be guaranteed for key process plant and other plant designed to fail to safe in the event of power failure.	The plant includes an emergency drive that runs off a 24VDC system and is designed to run for 2 hours off a battery support system.
		Appropriate precautions should be taken to minimise the risk of fire or explosion and to minimise the environmental consequences should a fire occur. Volatile gases released/desorbed from the waste material may have the potential to form explosive atmospheres. Areas of the site where flammable or explosive atmospheres may occur (e.g. waste storage, handling and processing areas) should be assessed and, where appropriate, classified into hazardous zones, in accordance with the requirements of DSEAR.	An emergency plan will be prepared for the proposed installation prior to plant start-up
		The Operator should produce emergency response plans for the potential accidents identified and assessed by the facility's accident management plan. Emergency plans should provide information on the layout of premises, type, quantity and hazards of materials onsite, location and type of firefighting equipment, the name of contacts in case of emergency and, where possible, be drawn up in consultation with the local fire service.	

		Procedures and training should be in place to manage identified risks and ensure the rapid initiation of the emergency plan should an accident occur. Where possible, the Operator should involve the emergency services in relevant emergency training activities.	Emergency response and training procedures have been implemented in accordance the installation’s existing Environmental Permit. These procedures will be amended to include the proposed plant.
		The design and operation of sealed batch-operated TDUs, and other plant /equipment that operate under pressure (e.g. vessels, pressurised storage containers, heat exchangers, shell and water tube boilers, pipework, safety devices and pressure accessories) may be subject to the requirements of the Pressure Systems Safety Regulations (PSSR).	The plant equipment will be reviewed and included as appropriate on the existing installations pressure systems register.
		At sites where combustible fine dusts are generated, handled or processed the design and operation of the facility should take into consideration the potential for dust explosion hazards.	A risk assessment will be undertaken and included in the emergency response plan for the proposed installation.

Operating techniques for emissions that do not screen out as insignificant

As discussed in the Key Issues section above, all pollutants associated with the emissions from the new biochar activity screen out as insignificant and therefore the measures proposed by the operator are BAT.

Operating techniques for emissions that screen out as insignificant

Emissions of NOx SO_2 and Particulate Matter have been screened out as insignificant in the context of the new biochar activity, and so we agree that the applicant's proposed techniques are Best Available Techniques (BAT) for the installation.

We consider that the emission limits included in the installation permit reflect the BAT for the sector.

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.

Odour management

We agree with the applicant that the odour risk profile of the site is not changing as a result of this variation.

Noise and vibration management

We agree with the applicant that the noise and vibration risk profile of the site is not changing as a result of this variation.

Dust management

We agree with the applicant that the noise and vibration risk profile of the site is not changing as a result of this variation. The wastes to be used in the biochar activity will be wet / damp in nature.

Waste types

We have specified the permitted waste types, descriptions and quantities, which can be accepted at the regulated facility.

We are satisfied that the operator can accept these wastes for the following reasons:

- they are suitable for the proposed activities
- the proposed infrastructure is appropriate; and
- the environmental risk assessment is acceptable.

During determination, it was discussed with the operator that the pyrolysis of some of the waste codes proposed to taken by the Biochar activity would require emissions to be modelled using Chapter IV ELVS as defined by the industrial emissions directive (IED). The operator subsequently revised the waste codes to include only wastes that are only of the type listed in point (b) of point 31 of Article 3 of IED, thereby making them exempt from Chapter IV ELV requirements.

Part of PO2, detailed in the Pre-operational condition PO2 below, requires the operator to have appropriate pre-acceptance and acceptance procedures to ensure adherence to this.

Pre-operational conditions

We have included a pre-operational condition to prevent the commencement of operation of the Biochar activity until the operator has finalised their waste acceptance criteria. The condition reads as follows:

PO2	Biochar production (AR9)	Prior to the commencement of commissioning, the Operator shall submit a written report to the Agency, and obtain the Environment Agency’s written approval to it, detailing the waste pre-acceptance and waste acceptance procedures to be used at the site. The waste procedures shall include:

		• the process and systems by which wastes unsuitable for pyrolysis at the site will be controlled; and • procedures to ensure waste wood received is only of the type listed in point (b) of point 31 of Article 3 of IED. The procedure shall be implemented in accordance with the written approval from the Agency.

We have included a pre-operational condition, preventing the operator from emitting from A1 until they have submitted an updated Air Quality assessment considering all emission points combined. The condition reads as follows:

PO3	Operation of MHT1 and Emission point AR1	Prior to the re-commissioning of activity AR1 and the associated emissions from A1, the operator shall submit an updated air quality impact assessment for assessment and written approval by the Environment Agency which demonstrates that air quality impacts associated with AR1, when combined with the air quality impacts associated with all other permitted activities, are acceptable.

Improvement programme

Based on the information on the application, we consider that we need to include an improvement programme.

The process being added to the permit is a new process. In order to ensure that the process is resource efficient and to meet the relevant BAT requirements for resource efficiency, we have placed the following Improvement Condition in the permit:

IC9	*The operator shall submit a report to the Environment Agency for review and written approval on the energy efficiency of the pyrolysis process (activity AR9 in table S1.1).* *The report shall include the following:*	*Within 8 months of operation commencing*

	• *Details of energy usage from at least 6 months operating time. This shall include natural gas used in the thermal oxidiser.* • *Details of the amount of waste heat used in the process and where it was used, from at least 6 months operating time.* • *An energy balance based on least 6 months operating time.* • *Options to improve the energy efficiency of the process, including whether waste heat from the thermal oxidiser can be used to heat the pyrolysis kiln in addition to the drying step.* • *Timescales for implementation of any improvement options identified.* *Improvements shall be implemented in line with the timescale agreed with the Environment Agency*	

We have determined that, given the new nature of the process, we require operating data before we can fully assess efficiency.

Also, we have marked as complete IC3 following satisfactory submission by the operator. We have marked IC6 as not required following no noise issues arising during the operation of the facility over a number of years. We have marked IC8 as not required due to the very low levels of dioxins emitted from the plant over a number of years of operation.

Emission limits

Emission Limit Values (ELVs) have been added for the following substances:

Parameter	Emission Limit
Oxides of Nitrogen	300 mg/m^3
Sulphur dioxide	50 mg/m^3
Particulate matter	40 mg/m^3

We agree with the operator that these ELVs provide a level of environmental protection that can be considered BAT. See Key Issues for discussion on Air Quality.

Monitoring and Reporting

We have decided that monitoring and reporting should be added for the following parameters, using the methods detailed and to the frequencies specified:

Parameter	Reference Period	Monitoring frequency	Monitoring standard / method
Oxides of Nitrogen	Average of three consecutive measurements of at least 30 minutes each	Annually	EN 14792 or CEN TS 17337
Sulphur dioxide		Annually	BS EN14791
Particulate matter		Annually	BS EN 13284-1

For the first year of operation we have specified that monitoring and reporting shall be carried out on a quarterly basis.

These initial additional requirements have been included to ensure that the new process can meet the ELVs that the operator's modelling report included.

Based on the information in the application we are satisfied that the operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate.

Management system

We are not aware of any reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.

The decision was taken in accordance with the guidance on operator competence and how to develop a management system for environmental permits

Previous performance

We have assessed operator competence. There is no known reason to consider the applicant will not comply with the permit conditions.

We have checked our systems to ensure that all relevant convictions have been declared.

No relevant convictions were found. The operator satisfies the criteria in our guidance on operator competence.

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 variation.

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.

Consultation Responses

The following summarises the responses to consultation with other organisations and the way in which we have considered these in the determination process.

Responses from organisations listed in the consultation section

Response received from. **UKHSA**

Brief summary of issues raised: The main emissions of potential concern are the additional NOx, SOx and particulate matter emissions to air from the pyrolysis plant. We note the applicant has enclosed an Air Quality Impact Assessment, however it is not clear from the document from where the Model Pollutant Emission Rates (Table 2.2 in the Air Quality Impact Assessment) have been derived for the new emission stack A11. We are however reassured that these emission rates appear to be conservative compared with other emissions sources on the site and therefore actual emissions will be lower. Good housekeeping and site maintenance measures should ensure the risk to public health remains low.

Based on the information contained in the application supplied to us, UKHSA has no significant concerns regarding the risk to the health of the local population from the installation.

Summary of actions taken: As discussed in the Key Issues section above, we have assessed all emissions associated with the variation application to be insignificant

Response received from: **Local Authority Environmental Health**

Brief summary of issues raised: No issues raised. Advised of no known amenity issues associated with the existing facility

Summary of actions taken: None required