



Summary of Waste Acceptance Procedures for BIOCCUS Project

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Report for Environment Agency

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Project.

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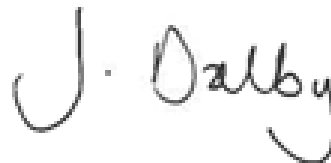
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Glossary

Abbreviation	Definition
BAT	Best Available Techniques
BATc	Best Available Techniques Conclusions
BEIS	Department for Business, Energy & Industrial Strategy
BIOCCUS	Biomass pyrolysis-based cogeneration system with biochar production and carbon capture, utilisation and storage
CC	Carbon Capture
CEMS	Continuous Emission Monitoring System
CHP	Combined Heat & Power
CO ₂	Carbon Dioxide
DAA	Directly Associated Activities
EA	Environment Agency
EMS	Environmental Management System
EPR	The Environmental Permitting (England and Wales) Regulations 2016
EWC	European Waste Code
IED	Industrial Emissions Directive
MCP	Medium Combustion Plant
MDEA	Methyldiethanolamine
PCC	Post-combustion carbon capture
PM	Particulate Matter
SG	Specified Generator
SHEQ	Safety, Health, Environmental and Quality
SWIP	Small Waste Incineration Plant

1 Introduction

This document updates the waste acceptance procedures for Ricardo's biochar production and carbon capture, utilisation and storage (BIOCCUS) project, in line with the Environment Agency's request for more information on 25th January 2023.

Ricardo will operate an Environmental Management System (EMS) that complies with the requirements of EA guidance which will be in place before commencement of operation. The EMS will be continually reviewed, at least annually and in response to any changes to the site, including but not limited to: operations or equipment (including permit variations), any accident, complaint, or breach of the permit.

As set out in the permit application, the EMS will include the following key elements to comply with the requirements defined in the Environmental Permitting Technical Note 5/1(18) reference document for the incineration / combustion of waste wood:

- Cleaning and maintenance
- Staff training
- Plant operation
- Waste acceptance procedures, including relevant acceptance criteria
- Bottom ash storage and disposal
- Emissions monitoring
- Plant failures
- Record keeping on all of the above

As per the requirements from the reference document for the incineration or combustion of waste wood, the operator will ensure EMS related records are kept for a minimum of 6 years or until permit surrender, whichever is earlier.

The following sections provide a summary of the waste acceptance procedures, in line with Environment Agency guidance on "non-hazardous and inert waste: appropriate measures for permitted facilities"¹, which will be incorporated into the EMS prior to commissioning.

It is noted that the majority of the feedstock for the plant will be virgin wood, i.e. not waste. The non-waste feedstock will undergo pre-acceptance checks to agree the source, description, nature and amounts of non-waste feedstock to be supplied. Upon delivery to the site, the non-waste feedstock will be visually inspected to ensure that it meets the criteria agreed with the supplier.

For the smaller proportion of feedstock that may be waste wood, the waste acceptance procedures in Section 2 apply.

2 Waste feedstock acceptance procedures

2.1 Waste feedstock pre-acceptance criteria

Prior to commissioning, Ricardo will implement pre-acceptance procedures so that parameters such as the composition of the waste feedstock are known before it arrives at the BIOCCUS facility. This information will be collected in order to assess and confirm that the waste feedstock is technically and legally suitable for the BIOCCUS facility and to be satisfied that the waste has been properly assessed and classified according to WM3. If the waste is accepted, records of the waste transfer documentation will be kept to justify the decision if needed. The pre-acceptance procedures will follow a risk-based approach, considering:

- the source, description (including European Waste Catalogue code) and nature of the waste feedstock

¹ <https://www.gov.uk/guidance/non-hazardous-and-inert-waste-appropriate-measures-for-permitted-facilities/3-waste-pre-acceptance-acceptance-and-tracking> [accessed 03/02/2023]

- potential risks to process safety, occupational safety and the environment (for example from odour and other emissions)
- knowledge about the previous waste holder(s)/producer

The source and nature of the waste feedstock, as well as information about previous waste holders, will be included on the waste transfer documentation, records of which will be kept for a minimum of 6 years or until permit surrender. The required classification code of the biomass will be stated in the purchase agreements with suppliers and, as agreed with the suppliers, the waste transfer documentation will be checked upon delivery to ensure that the waste delivered matches the waste described in the purchase agreements and waste transfer note. When necessary, Ricardo will update their information on any potential risks to process safety, occupational safety and the environment, as set out in the Operating Techniques. These will be made available to all staff in a central location and a hard copy will be kept in the site office.

As the proposed waste feedstock European Waste Catalogue (EWC) codes are all within the EWC codes accepted under Environmental Permitting Technical Note PG5/1, the potential risks to process safety, occupational safety and the environment are low, as set out in the Operating Techniques. It is noted that, due to the R&D nature of the project, more than one feedstock will be tested, including virgin wood, so not all feedstock will be waste. However, any waste wood used will fall within the list of acceptable waste codes listed in the Environmental Permitting Technical Note PG5/1(21) reference document for the incineration or combustion of waste wood, as set out in Table 1. Ricardo is applying to accept all of these waste codes as potential feedstock for the BIOCCUS project.

Table 1: Acceptable waste codes under PG5/1(21)

EWC Code	Description	Further restriction
02 01 03 02 01 07	Plant tissue waste from agriculture, horticulture and forestry	-
03 01 01	Waste bark and cork from wood processing and the production of panels and furniture	No chemical treatment applied
03 01 05	Sawdust, shavings, cuttings, wood, particle board and veneer that is fixed to the board other than those mentioned in 03 01 04	No chemical treatment applied
03 03 01	Waste bark and wood from pulp, paper and cardboard production and processing	No chemical treatment applied
15 01 03	Wooden packaging	Visibly clean wooden packaging, including pallets, no chemical treatment applied
19 12 07	Wood other than wood containing hazardous substances (19 12 06) from waste management facilities	Source segregated visibly clean single waste wood stream such as pallets where no chemical treatments have been applied Post-segregation of mixed waste wood stream from civic amenity sites or skip hire operators is not sufficient

Any waste wood that has been classified as hazardous waste or has come from construction and demolition works (i.e. Grade B, C & D), will not be used as a feedstock for BIOCCUS.

On an annual basis and should the waste types to be accepted change at any point in the process, the information required at pre-acceptance will be reassessed and the EA will be notified of any relevant changes via the permit variation process.

2.2 Waste feedstock acceptance criteria

Ricardo will implement waste acceptance procedures to check that the characteristics of the waste received matches the information provided during waste pre-acceptance. This is to confirm the waste is as expected and that it can be accepted to the BIOCCUS facility. If the waste does not conform to the pre-acceptance information, it may still be acceptable if it falls within the list of wastes allowed by the permit and the facility can handle it appropriately.

As with the pre-acceptance procedures, the acceptance procedures will also follow a risk-based approach, considering:

- The source, nature and age of the waste
- Potential risks to process safety, occupational safety and the environment (for example, from odour and other emissions)
- The potential for self-heating
- Knowledge about the previous waste holder(s)

As set out in section 2.1, the waste transfer documentation will contain the necessary information about the source, nature and age of the waste as well as any previous waste holder. The Operating Techniques addresses the potential risks of the accepted wastes, will be kept in easily accessible electronic and site-based locations and will be updated as and when necessary. The types of waste to be accepted at the site have a very low potential for self-heating and EA guidance note PG 5/1 does not require a Fire Prevention Plan for these types of installations. Wastes will not be stored on site for longer than one month and, if different types of waste wood are stored on site at any one time, they will be kept segregated. It is, however, expected that only one feedstock type will be stored on site at any one time. These measures will help reduce the potential for and impacts of any fire events on site.

The site team will carry out basic visual inspections on each delivery to the site to ensure the feedstock matches the EWC code provided on the waste transfer documentation, that the EWC code is one of the codes allowed by the permit and that the waste complies with any further restrictions (e.g., ensuring 15 01 03 is visibly clean wooden packaging). Waste will only be accepted on the site if the site has the capacity to store and handle the waste at that time and in line with the requirements of the permit.

All transfer documentation will be checked and validated and discrepancies resolved before the waste is accepted on the site. If it is believed that the incoming waste classification or description is incorrect or incomplete, then the original waste producer or waste carrier (or both) will be contacted to resolve this. If the waste has been assessed as acceptable for on-site storage or treatment, this will be recorded and records kept, usually in the form of waste transfer notes, for at least 6 years or until permit surrender.

Each load of waste will be measured on arrival to confirm the quantities against the accompanying waste transfer documentation. A system will be put in place to calculate the weight of the deliveries based on the volume and density of each delivery. The volume and calculated weight will be recorded on an electronic system, so the available capacity at the BIOCCUS facility can be monitored.

As set out in the Operating Techniques, the areas in which the waste feedstock will be offloaded and stored (i.e. the building) will have a concrete surface and will be in an enclosed building with fast acting roller shutter doors, to prevent any potentially polluting liquid from escaping off site.

2.3 Non-conforming wastes and quarantine

In the event that unacceptable/non-conforming waste is identified at the site entrance, the load will not be accepted and will be sent back to the supplier.

In the unlikely event that the unacceptable/non-conforming waste is identified after it has been unloaded in the building, the load will be kept in the building in a designated quarantine area, away from other wastes and ignition sources, until a suitably licensed waste handler collects it for disposal or treatment at another licensed site. The designated quarantine area will be separate from all other storage areas, clearly marked as a quarantine area and always kept free of obstruction, unless in use. The quarantine area will be located on a concrete surface within a building and therefore risks of contaminated runoff and fugitive emissions or impacts of rain/wind will be kept very low. The quarantine area will be able to store a maximum volume of 40m³ of non-conforming waste.

Non-conforming wastes will be stored in the quarantine area on site for no longer than one month while awaiting collection by a suitably licensed waste handler. In the very unlikely event that the waste is infested or odorous, it will be removed within 24 hours. The relevant supplier or waste producer will be notified of this non-conformance. Details of the non-conformance, reasons for accepting the waste and actions to reduce the chances of the same non-conformance occurring will be recorded on the site's electronic system.

Where hazardous waste is rejected, the procedure set out in the EA's rejected loads guidance will be followed. In line with the site's Operating Techniques and management systems, the people carrying out waste acceptance checks will be trained to effectively identify and manage any non-conformances in the loads received, so as to comply with the Duty of Care for waste as well as the conditions of the permit. Staff will watch waste being unloaded, in order to identify non-conforming waste and enable quarantining the non-conforming waste before it is mixed with other material. Staff will be made aware of the procedures for quarantining waste and a copy of the procedures will be kept on the electronic system and in an accessible location on site.

2.4 Waste feedstock handling, storage & drying

Untreated wood chips (the feedstock) are dried using the residual heat from the flue gas scrubber cooler and Amine reflux condenser, before entering the pyrolysis process. The pyrolysis process can be fed at a rate of up to 350 kg/hr biomass, equating to 1.2 - 1.9 MWth, depending on the Lower Heating Value of the feedstock.

The feedstock dryer is an existing piece of equipment that is fitted with its own controller. It measures the moisture of the feedstock output and controls the fan speeds to regulate this to a desired setpoint. In addition, it controls the feedstock conveyors and monitors temperatures within the unit.

The estimates for consumption of raw materials and water are presented in Table 2 and are based on 8,000 hours of operation per year. It should be noted that the initial phases of operation will be significantly lower than 8,000 hours per year while the technology is being demonstrated and evaluated.

The biomass feedstock will be delivered via road and will be unloaded onto the floor of the building prior into a central pile as set out in the Operating Techniques. The building has fast acting roller shutter doors to allow access. No more than 125 tonnes of waste wood will be stored on site at any one time and it will be kept in piles less than 4m high. Only clean, untreated (grade A) waste wood will be stored prior to use in the BIOCCUS process. Waste wood will be stored for a maximum of one month at a time, but in most cases the storage time will be much lower. No other waste activity or treatment of the waste wood (shredding, chipping or pre-treating) will be carried out on site.

Table 2: Raw material consumption - biomass

Raw material	Storage Arrangements	Handling Requirements	Annual Consumption (tonnes per annum)	Environmental Effects	Alternatives
Biomass (Waste wood See Table 1 for EWC codes)	Stored under cover in the building to keep dry, in piles less than 4 m high. No more than 125 tonnes stored at any one time	No specific handling requirements	2,800	No adverse environmental effects from the types of waste wood accepted (Grade A).	Virgin wood will also be tested at the site.

2.5 Waste tracking

An electronic system will be used by site staff to hold up-to-date information about the available capacity of the facility, for example reception, quarantine, treatment and storage areas. A pre-booking system will be used with suppliers to make sure that there is enough waste storage and process capacity for the incoming acceptable waste.

The electronic system will hold all the information generated during:

- pre-acceptance
- acceptance
- non-conformance or rejection
- storage
- repackaging
- treatment
- removal off site

This information will be readily accessible to all relevant staff members.

Records will be kept of deliveries, on-site treatment and despatches. The tracking system will also operate as a waste inventory and stock control system, including wastes produced at the facility. As a minimum, it will include the following information:

- the date the waste arrived on site
- the original producer's details (or unique identifier)
- a unique reference number
- waste pre-acceptance and acceptance information
- the package type and size
- the intended treatment or disposal route
- the nature and quantity of wastes held on site
- where the waste is physically located on site
- where the waste is in the designated recovery or disposal process
- identifying the staff who have taken any decisions about accepting or rejecting waste streams and who have decided on recovery or disposal options
- details that link waste to relevant transfer notes
- details of any non-conformances and rejections, including consignment notes for waste rejected because it is hazardous

The electronic system will be able to report the following information for each of the EWC codes accepted:

- the total quantity of waste present on site at any one time
- a breakdown of the waste quantities being stored pending on-site treatment or awaiting onward transfer
- where a batch of waste is located based on a site plan
- the quantity of waste on site compared with the limits in the management system and permit
- the length of time the waste has been on site compared with the limits in the management system and permit

Back-up copies of records will be stored off site in a location that will be readily accessible in an emergency.

Acceptance records will be kept for a minimum of 2 years after the waste has been treated or removed off site.



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