Best Available Techniques Assessment Variation to Installation Permit

Site name:	**Piddlehinton AD Facility**
Site address:	**Bourne Park Industrial Estate, Piddlehinton, Dorchester, Dorset, DT2 7YU**
Operator name:	**Eco Sustainable Solutions Limited**

Written by Emily Shann Pitts, Shann Pitts Consulting, 26 January 2023

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1. Introduction

A Best Available Techniques (BAT) Assessment has been prepared by Shann Pitts Consulting (SPC) on behalf of Eco Sustainable Solutions Limited to support an application for a substantial variation permit application to vary the existing bespoke waste operation permit to a bespoke installation permit for the anaerobic digestion (AD) plant at Piddlehinton AD Facility, Bourne Park Industrial Estate, Piddlehinton, Dorchester, Dorset, DT2 7YU herein termed 'the Site'.

The application has been prepared by SPC in conjunction with and on behalf of the Operator Eco Sustainable Solutions.

This report comprises a review of the operation, activities, infrastructure, management systems, etc. for the site, in comparison to the requirements of indicative BAT as stated in the BREF document 'Best Available Techniques Reference Document for Waste Treatment'[1] to ensure that all relevant areas are included to ensure that all relevant areas are included.

The aim of this report is to provide confidence to the Environment Agency that Eco Sustainable Solutions has both considered the requirements of BAT and operates the site in compliance with the requirements of indicative BAT.

The report is structured in table format in the same order as set out in 2018 Best Available Techniques (BAT) Reference Document for Waste Treatment to ensure a logical review of the requirements of indicative BAT. Next to each relevant requirement there is a summary of the proposals and a comparison against indicative BAT.

The final section comprises conclusions and recommendations.

[1] Best Available Techniques (BAT) Reference Document for Waste Treatment, European IPPC Bureau, 2018

2. BAT Assessment for Piddlehinton AD Facility

Environmental Management System

BAT 1	**BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features**	
I	Commitment of the management, including senior management;	Senior management of Eco Sustainable Solutions have committed to the establishment and maintenance of an environmental management system (EMS) which is certified under ISO14001. Environmental Objectives have been set in the form of Objectives and Key Results (OKRs) (like KPIs) which are reviewed by management on a quarterly basis. Ref: Environmental Policy Statement **(ECO-OD-03)** / Operations OKR document
II	Definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation;	The Environmental Policy includes a commitment to measure, record and monitor environmental performance of Eco key significant environmental aspects in order to continually improve the Environmental Management System. Ref: Environmental Policy Statement **(ECO-OD-03)**
III	Planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment by the management;	The EMS documents are detailed within the Document Master List (DML) **(ECO-OD-01)** and includes Standard Operating Procedures and Environmental Objectives. The EMS has been developed and approved by senior management who are also responsible for financial planning and investment decisions.
IV	Implementation of procedures paying particular attention to: • structure and responsibility, • recruitment, training, awareness and competence, • communication, • employee involvement, • documentation, • effective process control, • maintenance programmes, • emergency preparedness and response, • safeguarding compliance with environmental legislation;	There are management system documents and procedures covering all of these elements as detailed in the Document Management List **(ECO-OD-01).** • Roles and responsibilities are detailed within the EMS Manual **(ECO-OD-02)** and the Management Procedure Organisational roles, responsibilities & authorities **(ECO-MP-04).** • The management of Competence and Awareness are detailed in Sections 10.1 and 10.2 of the EMS Manual **(ECO-OD-02)** respectively and training is documented on Training Matrix. • There is a Management Procedure for Communication **(ECO-MP-02)** which sets out what aspects of the Integrated Management System (IMS) will be communicated internally and externally. It also defines who will be communicated with and what format the communication will be in. In

BAT 1	**BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features**	
		accordance with the EMS Manual **(ECO-OD-02)**, the Environmental Policy Statement **(ECO-OD-03)** is communicated to all Eco staff and interested parties via induction, emails, meetings and presentations. • Document control is in place and all documents benefit from version control which is managed through the Document Control Procedure **(ECO-MP-01)** and recorded in the Document Master List **(ECO-OD-01)**. • The process is monitored and controlled in accordance with PAS110 SOPs **(ECO-OP-11).** • All plant and equipment is subject to a planned preventative maintenance programme in accordance with the maintenance planner for the site and as detailed under BAT 14; • There is a site-specific Emergency Response Plan **(ECO-EP-03).** • The EMS includes a Compliance Obligations Register **(ECO-OD-07**) which is regularly reviewed and updated to ensure that management procedures take account of legal and guidance obligations. Section 8.2 of the EMS Manual **(ECO-OD-02)** describes how Compliance Obligations are integrated into the management system.
V	Checking performance and taking corrective action, paying particular attention to: • monitoring and measurement, • corrective and preventive action, • maintenance of records, • independent (where practicable) internal or external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained.	The management system incorporates: • Checking performance through a planned audit and inspection schedule (the site has 3 or 4 inspections / audits per year). • A Non- Conformance Reporting Management Procedure **(ECO-MP-07)** • Records of audits, inspections and non-conformances are held electronically on a shared drive which is backed up onto the cloud. • The EMS is certified under ISO 14001 and is therefore subject to internal and external auditing.
VI	Review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;	ISO 14001 Management Review Meetings are carried out at least annually in accordance with Section 16 of the EMS Manual **(ECO-OD-02).** There is a Management Review matrix in place to ensure that all items are covered at least annually.

BAT 1	BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features	
VII	Following the development of cleaner technologies;	Eco Sustainable Solutions are active members of the Renewable Energy Association (REA) (trade body) and have a network of contacts within the industry to keep well informed of industry developments. Eco Sustainable Solutions will take the opportunity to adopt cleaner technologies where possible. In accordance with the Environmental Policy Statement **(ECO-OD-03):** *'The introduction of new recycling and renewable energy technologies will be effectively planned and managed to ensure adverse environmental impacts are designed out and the maximum environmental opportunities are obtained'.*
VIII	Consideration for the environmental impacts from the eventual decommissioning of the plant at the stage of designing a new plant, and throughout its operating life;	The EMS includes a Decommissioning Plan which meets the requirements of BAT.
IX	Application of sectoral benchmarking on a regular basis;	The Environmental Policy **(ECO-OD-03)** includes an objective to *'protect the local environment where Eco operates by adhering to all compliance obligations set by interested parties.'* Through industry connections and networking including as REA members, Eco Sustainable Solutions compare environmental performance with other operators and strive to improve their performance through environmental objectives.
X	Waste stream management (see BAT 2);	See BAT 2
XI	An inventory of waste water and waste gas streams (see BAT 3)	See BAT 3
XII	Residues management plan - A residues management plan is part of the EMS and is a set of measures aiming to: • minimise the generation of residues arising from the treatment of waste, • optimise the reuse, regeneration, recycling and/or recovery of energy of the residues, and • ensure the proper disposal of residues.	The EMS includes a Residues Management Plan **(ECO-MP-25)** which meets the requirements of BAT.
XIV	Odour management plan	See BAT 12.
XV	Noise and vibration management plan	See BAT 17.

Waste Management Measures

BAT 2	**In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques given below.**	
Waste pre-acceptance		
a	Set up and implement waste characterisation and pre-acceptance procedures.	In accordance with the Piddlehinton Feedstock Acceptance and Rejection Procedure **(ECO-OP-25):** • Wastes are only accepted from approved suppliers which have been completed an 'agreement to supply waste' prior to acceptance at site. • Liquid waste will be sampled and analysed as per waste supply agreement or when deemed appropriate by the AD Manager. Any unsuitable material will not be accepted at the facility. Any new waste supplied will be analysed prior to acceptance. Feedstocks are tested for the following parameters; pH, dry matter, chlorides, biochemical methane potential (BMP); periodic bullet analyses and annual biological BMP. The frequency of feedstock testing depends on feedstock type. If it is a variable feedstock or there is e.g. potential for chloride issues then testing will be more frequent.
Waste acceptance		
b	Set up and implement waste acceptance procedures	Quality requirements and waste acceptance criteria are clearly set out within the Piddlehinton Feedstock Acceptance and Rejection Procedure **(ECO-OP-25).**
Waste tracking		
c	Set up and implement a waste tracking system and inventory. A waste tracking system and inventory aims to track the location and quantity of waste in the plant. It holds all the information generated during waste pre-acceptance procedures (e.g., date of arrival at the plant and unique reference number of the waste, information on the previous waste holder(s), pre-acceptance and acceptance analysis results, intended treatment route, nature and quantity of the waste held on site including all identified hazards), acceptance, storage, treatment and/or transfer off site.	Waste is only delivered to site if there is an 'agreement to supply waste' in place. All received materials are brought across the weighbridge and accounted for. Products delivered to site such as glycerol and rice bran are pre booked by the AD Manager. Consistent blends of feedstock are achieved by monitoring the dry matter at the buffer tanks every week and adjusting the amount of liquid (milk washings) added to the feedstock mix. Waste coming into site is measured on the automated weighbridge. Pre-treated waste entering the AD process is measured through SCADA (daily feed program to D1 and D2) and verified through monitoring of levels within the 2 No. 422m^3 Buffer Tanks. The weighbridge computer ensures that the following data is recorded: 1. For each load:

BAT 2	In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques given below.	
		○ Type of material (description) ○ European Waste Catalogue (EWC) code ○ Source ○ Waste Transfer note reference ○ Net weight of waste ○ Date and time accepted ○ Haulier ○ Haulier's licence number ○ Origin of waste ○ Time and date ○ Record declaration of previous load acceptable and wash out certificate provided if required (e.g., ABP waste) ○ Vehicle registration number 2. For each load rejected at the weighbridge: ○ Type of material ○ EWC code ○ Source ○ Waste Transfer note reference ○ Tonnage ○ Date & time rejected ○ Reason for rejection / potential hazard as appropriate ○ Rejected by (name of staff member) ○ Destination of rejected material For each load rejected in the Reception Building the **AD Manager** is responsible for recording the following for each load / part load rejected upon visual inspection on the Waste Rejection Record **(ECO-FT-34**): ○ Type of material ○ EWC code ○ Source ○ Waste Transfer note reference ○ Tonnage ○ Date & time rejected

BAT 2	**In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques given below.**	
		○ Reason for rejection / potential hazard as appropriate ○ Rejected by (name of staff member) ○ Destination of rejected material The **AD Manager** is responsible for checking the following data is recorded into the waste correctly: • Waste that has been received • Waste that is rejected
Output quality		
d	Set up and implement an output quality management system	<u>Digestate quality</u> Eco Sustainable Solutions is a registered producer under the Biofertiliser Certification Scheme (BCS) for PAS110 certified digestate as a 'Quality Output' achieving end of waste status under the AD Quality Protocol (ADQP). The digestate is classified as digestate liquor in accordance with PAS110 as the dry matter is approximately 4-5% dry matter.
Waste segregation		
e	Ensure waste segregation. Waste is kept separated depending on its properties in order to enable easier and environmentally safer storage and treatment. Waste segregation relies on the physical separation of waste and on procedures that identify when and where wastes are stored.	Liquid food waste, delivered in tankers, is dispatched into the 2 No. liquid waste tanks ($30m^3$ each) within the Reception Building. Solid food waste is tipped in a reception pit inside the Reception Building. Most material is deposited directly by tipper vehicle into the reception pit. However, very dry material (>25% dry matter) is deposited into one of the holding bays for mixing with the food waste in the hopper as it is too dry to be fed directly into hammer mill.
f	Ensure waste compatibility prior to mixing or blending of waste	Due to the nature of the feedstocks and waste pre-acceptance checks there is no potential for issues with waste compatibility.
g	Sort incoming solid waste	Sorting of incoming solid wastes is carried out as described above (e).

Inventory of Waste Water and Waste Gas

BAT 3	**In order to facilitate the reduction of emissions to water and air, BAT is to establish and to maintain an inventory of waste water and waste gas streams, as part of the environmental management system (see BAT 1), that incorporates all of the following features:**	
i	Information about the characteristics of the waste to be treated and the waste treatment processes, including: • simplified process flow sheets that show the origin of the emissions; • descriptions of process-integrated techniques and waste water/waste gas treatment at source including their performances;	Origin of Emissions / Emission Points The Process Flow Diagram (Appendix A) shows inputs and outputs including the origin of any emissions. Emissions to air are: • EP1 - Odour abatement for Reception Hall (biofilter) • EP2 - Odour abatement for pasteuriser (biofilter) • EP3 - Gas engine (249kw, G3005) • EP4 - Gas engine (249kw, G3006) • EP5 - Gas engine (550kw, G4036) • EP6 - Gas engine (550kw, G4037) • EP7 - Flare stack - new location • EP8 - Pressure Relief valve Digester 1 • EP9 - Pressure Relief valve Digester 2 • EP10 - Back-up generator exhaust (single phase) • EP11 - Back-up generator exhaust (3-phase) Emissions to water are: • EP12 - Clean rainwater to soakaway Treatment Techniques There is no waste water treatment. Waste gas treatment is described below: *Biogas treatment* The digester tanks are dosed with ferric chloride to reduce hydrogen sulphide (H_2S) levels in the biogas. Once out of storage the biogas passes through a gas cooling system to reduce moisture and then through a filter to reduce hydrogen sulphide (currently 'Ferrasorp' but may revert to carbon again in the future) and then to the CHPs.

BAT 3	**In order to facilitate the reduction of emissions to water and air, BAT is to establish and to maintain an inventory of waste water and waste gas streams, as part of the environmental management system (see BAT 1), that incorporates all of the following features:**	
		Biofilters There are two biofilters, one for the process building extraction and one for the pasteurisation exhaust. Both biofilters utilise woodchip media material and aerobic conditions for naturally occurring microorganisms growing on the media to breakdown organic compounds. Air flow and moisture are optimised by the operator to maximise efficacy of the biofilters.
ii	Information about the characteristics of the wastewater streams	There is no waste water as all dirty water generated is used in the AD process.
iii	Information about the characteristics of the waste gas streams, such as: • average values and variability of flow and temperature; • average concentration and load values of relevant substances and their variability (e.g., organic compounds, POPs such as PCBs); • flammability, lower and higher explosive limits, reactivity; • presence of other substances that may affect the waste gas treatment system or plant safety (e.g., oxygen, nitrogen, water vapour, dust).	Biogas quality is good – slight variances, but generally between 58-62% methane. Hydrogen sulphide is generally kept below 100ppm with an absolute maximum of 500pm. The biogas is stored in the domes above the two digesters. Biogas has a lower explosive limit of approximately 6% by volume and a higher explosive limit of approximately 12% by volume. After storage the biogas then passes through a chiller to remove the moisture and then through a filter to reduce hydrogen sulphide (currently 'Ferrasorp' but may revert to carbo again in the future) and then to the CHPs. Waste gas may arise in the form of biogas during periods of extended breakdown and maintenance. Waste gas is burnt in the flare.

Waste Storage

BAT 4	**In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below.**	
a	Optimised storage location. This includes techniques such as: • the storage is located as far as technically and economically possible from sensitive receptors, watercourses, etc.; • the storage is located in such a way so as to eliminate or minimise the unnecessary handling of wastes within the plant (e.g., the same wastes are handled twice or more or the transport distances on site are unnecessarily long).	Solid waste feedstock is stored in the dedicated Reception Building benefiting from fast-acting roller shutter door and an odour abatement system (biofilter). Solid food waste is tipped in a reception pit inside the Reception Building, which minimises handling of the waste. Most material is deposited directly by tipper vehicle into the reception pit. However, very dry material (>25% dry matter) is deposited into one of the holding bays for mixing with the food waste in the hopper as it is too dry to be fed directly into hammer mill. Liquid waste in tankers is transferred to the 2. No Liquid Waste storage tanks within the Reception Building for storage prior to treatment in the two digesters.
b	Adequate storage capacity. Measures are taken to avoid accumulation of waste, such as: • the maximum waste storage capacity is clearly established and not exceeded taking into account the characteristics of the wastes (e.g., regarding the risk of fire) and the treatment capacity; • the quantity of waste stored is regularly monitored against the maximum allowed storage capacity; • the maximum residence time of waste is clearly established.	The proposed maximum annual tonnage of waste is 50,000 tonnes per year which is an increase from 42,000 tonnes per year in current permit. See below the treatment capacity calculations based on proposed 50,000 tonnes per annum: *The two digester tanks (with a maximum working capacity of 2,227 m^3 each) operate in parallel. The Pre-storage tanks and the Digestate storage tank have not been included in the treatment capacity calculation as there is no gas collection from these tanks.* *Conversion factor for digesting material in tanks: 1 m^3 is equivalent to 1 tonne* *The minimum hydraulic retention time is 35 days; calculated as follows:* • *Net capacity in D1 and D2 combined= 4,454m^3 (verified by Weltec)* • *50,000t/annum minus 6% for waste plastic rejects= 47,000t* • *47,000 divided by 365 days is= 128.77* • *4,454 divided by 128.77= 35 HRT* *Treatment capacity of 1 digester = 2,227 / 35 = 64 tonnes per day* *As there are 2 digesters - Total treatment capacity = 2 x 64 = 128 tonnes per day* This uplift to 50,000 tonnes per annum is viable due to an upgrade to the heat exchanger (300kw to 600kw) which will significantly decrease times for heating up and cooling down

<table>
<tr><td>BAT 4</td><td colspan="2">In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below.</td></tr>
<tr><td></td><td></td><td>digestate in the pasteurisers, which is currently 116 m^3 /day based on 29 batches of 4m^3 / day, i.e., less than the 128 tonnes per day which the digesters are capable of processing.

The Depackaging Plant can process up to 12 tonnes per hour; the throughput is between 8 tonnes per hour and 12 tonnes per hour depending on feed rate.

The maximum storage capacities and residence times are detailed in Table 1 below. The 3. No Holding bays in the Reception Building (50 tonnes each) can be used for contingency storage if the Reception Pit becomes full.

Table 1 – Waste Storage

<table>
<tr><th>Type of waste</th><th>Storage location within Reception Building</th><th>Maximum tonnage at any one time (tonnes)</th><th>Maximum residence time</th></tr>
<tr><td>Loose or packaged food waste</td><td>Pit in Reception Building</td><td>120</td><td>48 hours</td></tr>
<tr><td>Loose or packaged food waste</td><td>2. No Holding bays (approximately 50 tonnes each)</td><td>100</td><td>48 hours</td></tr>
<tr><td>Liquid waste</td><td>2. No liquid waste tanks</td><td>60</td><td>2 days</td></tr>
<tr><td>Plastic rejects</td><td>1. No. Holding bay</td><td>50</td><td>1 week</td></tr>
<tr><td colspan="2">Total storage capacity</td><td>330</td><td></td></tr>
</table>
</td></tr>
<tr><td>c</td><td>Safe storage operation. This includes measures such as:

• equipment used for loading, unloading and storing waste is clearly documented and labelled;</td><td>There is a dedicated telescopic handler for solid food waste.

The wastes streams accepted for processing are not sensitive to heat, light, air, water etc. and therefore do not need to be protected from ambient conditions.</td></tr>
</table>

BAT 4	**In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below.**	
	• wastes known to be sensitive to heat, light, air, water, etc. are protected from such ambient conditions; • containers and drums are fit for purpose and stored securely.	
d	Separate area for storage and handling of packaged hazardous waste. When relevant, a dedicated area is used for storage and handling of packaged hazardous waste.	Hazardous waste is not accepted in accordance with Piddlehinton Feedstock Acceptance and Rejection Procedure **(ECO-OP-25).**

Waste Handling & Transfer

BAT 5	**In order to reduce the environmental risk associated with the handling and transfer of waste, BAT is to set up and implement handling and transfer procedures.**	
	Handling and transfer of waste are carried out by competent staff.	All waste handling and transfer activities are carried out by trained staff in accordance with Standard Operating Procedures PAS 110 SOPs **(ECO-OP-11).**
	Handling and transfer of waste are duly documented, validated prior to execution and verified after execution;	Waste is only accepted in line with a supplier agreement. Products delivered to site such as glycerol and rice bran are pre booked by the AD Manager. All feedstocks coming into site are recorded on the weighbridge and the data stored on the weighbridge computer. This includes feedstock type, tonnage, date, and time. Pre-treated waste entering the AD process is measured through SCADA (daily feed program to D1 and D2) and verified through monitoring of levels within the 2 No. 422m^3 Buffer Tanks.
	Measures are taken to prevent, detect and mitigate spills;	The Piddlehinton Feedstock Acceptance and Rejection Procedure **(ECO-OP-25)** includes measures for spillage prevention including a procedure for liquid waste dispatch. Spillages are managed in accordance with the Piddlehinton Emergency Preparedness Plan **(ECO-EP-03)**. All new starters are trained on the plan and refresher training is provided as required and includes spill response scenarios.
	Operation and design precautions are taken when mixing or blending wastes (e.g., vacuuming dusty/powdery wastes).	Waste is only mixed within the enclosed waste treatment infrastructure within the Reception Building and within the sealed tank infrastructure.

Monitoring

BAT 6	**For relevant emissions to water as identified by the inventory of waste water streams (see BAT 3), BAT is to monitor key process parameters (e.g., waste water flow, pH, temperature, conductivity, BOD) at key locations (e.g., at the inlet and/or outlet of the pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation).**
	There are no emissions to water. Dirty water from the Reception Building and, in the case of spillages, from the secondary containment sump is collected and reused in the process.

BAT 7	**BAT is to monitor emissions to water with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.**
	Not applicable, see BAT 6.

Monitoring of Point Source Emissions to Air

BAT 8	**BAT is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.**	
H_2S	Once every six months. No EN standard available. See BAT 34	Odour monitoring of the biofilters will be carried out every 6 months in lieu of H_2S and NH_3 monitoring as per BAT 34.
NH_3	Once every six months. No EN standard available. See BAT 34	Odour monitoring of the biofilters will be carried out every 6 months in lieu of H_2S and NH_3 monitoring as per BAT 34.
Odour concentration	Once every six months EN 13725. The monitoring of NH_3 and H_2S may be used as an alternative to the monitoring of the odour concentration. See BAT 34	Odour monitoring will be carried out every 6 months as per BAT 34.

BAT 9 Not Applicable

BAT 10	**BAT is to periodically monitor odour emissions.**	
	Odour emissions can be monitored using: • EN standards (e.g., dynamic olfactometry according to EN 13725 in order to determine the odour concentration or EN 16841-1 or -2 in order to determine the odour exposure); • when applying alternative methods for which no EN standards are available (e.g., estimation of odour impact), ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality. The monitoring frequency is determined in the odour management plan (see BAT 12).	Monitoring will be carried out in accordance with EN standards (e.g., dynamic olfactometry according to EN 13725 in order to determine the odour concentration) in accordance with BAT 8 and BAT 34. The Piddlehinton Odour Management Plan **(ECO-SM-14)** incorporates biofilter monitoring.

Material Efficiency

BAT 11	**BAT is to monitor the annual consumption of water, energy and raw materials as well as the annual generation of residues and waste water, with a frequency of at least once per year.**	
	Monitoring includes direct measurements, calculation or recording, e.g., using suitable meters or invoices. The monitoring is broken down at the most appropriate level (e.g., at process or plant/installation level) and considers any significant changes in the plant/installation	Eco Sustainable Solutions maintains a log of: • Wastes accepted for treatment via weighbridge computer and Waste Transfer Notes • Any residual waste removed off site (Waste Transfer Notes / Quarterly Waste Returns). Recorded on Piddlehinton dashboard for internal review. • There is no waste water produced on site as dirty water is recirculated through the AD plant for treatment. • Water usage is measured via a flow meter. • Energy used is measured via a meter which measures mains electricity imports. This is recorded weekly from the meter. • Raw materials used: oil, Ferrasorp, carbon, ferric chloride • Digestate produced • Biogas production, electricity, and heat generation Waste production is recorded and audited in accordance with the Piddlehinton Residues Management Plan **(ECO-MP-25).** Eco Sustainable Solutions will report the following to the Environment Agency on an annual basis, or as stipulated in the Environmental Permit. • Waste in and out (waste returns) on a quarterly basis • Digestate production • Raw material usage • CHP engine usage • CHP engine efficiency • Emergency flare operation – hours of usage • Electricity exported • Energy usage; and • Water usage

Fugitive Emissions to Air

BAT 12	**In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to set up, implement and regularly review an odour management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:**	
	A protocol containing actions and timelines;	A Piddlehinton Odour Management Plan (OMP) **(ECO-SM-14)** has been developed as part of the Environmental Management System and includes a protocol containing actions and timelines.
	A protocol for conducting odour monitoring as set out in BAT 10;	The OMP contains a section on odour monitoring as described in BAT 10. Point source emission monitoring from the odour abatement plant stack will be carried out periodically and in accordance with EN standards (e.g., dynamic olfactometry according to EN 13725 in order to determine the odour concentration).
	A protocol for response to identified odour incidents, e.g., complaints;	The OMP contains a section detailing the protocol for responding to odour incidents including complaints.
	An odour prevention and reduction programme designed to identify the source(s); to characterise the contributions of the sources; and to implement prevention and/or reduction measures.	The OMP includes an odour prevention and reduction programme designed to identify the source(s); to characterise the contributions of the sources; and to implement prevention and/or reduction measures.

BAT 13	**In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to use one or a combination of the techniques given below.**	
a	Minimising residence times	See BAT 4 b – Table 1 which includes waste storage residence times.
b	Using chemical treatment	This technique is not used.
c	Optimising aerobic treatment	The biofilters uses aerobic treatment to break down odorous compounds within the air stream. The potential for aerobic treatment is maximised by providing a large surface area onto which microbes to adhere within the woodchip media and the provision of ducting to enable air movement.

BAT 14	**In order to prevent or, where that is not practicable, to reduce diffuse emissions to air, in particular of dust, organic compounds and odour, BAT is to use an appropriate combination of the techniques given below.**	
a	Minimising the number of potential diffuse emission sources. This includes techniques such as: • appropriate design of piping layout (e.g., minimising pipe run length, reducing the number of flanges and valves, using welded fittings and pipes); • favouring the use of gravity transfer rather than using pumps; • limiting the drop height of material; • limiting traffic speed; and • using wind barriers.	The plant design is optimised to reduce pipe run lengths, flanges and valves. Vehicles are restricted to 5 miles per hour on site as a health and safety measure; this also reduces potential noise and dust emissions. Fugitive emissions of odour are monitored daily in accordance with the Piddlehinton Odour Management Plan **(ECO-SM-14)** and recorded in the Piddlehinton AD Site Daily Record Sheet.
b	Selection and use of high- integrity equipment. This includes techniques such as: • valves with double packing seals or equally efficient equipment; • high-integrity gaskets (such as spiral wound, ring joints) for critical applications; • pumps/compressors/agitators fitted with mechanical seals instead of packing; • magnetically driven pumps/ compressors/agitators;	All equipment and systems on site are supplied as per vendors original specification and are maintained to that standard thereafter when replacing. There are examples within the site infrastructure of all of the techniques listed.
c	Corrosion prevention	Materials are selected for suitability and longevity.
d	Containment, collection and treatment of diffuse emissions	Odour emissions from the Reception Building are minimised by the building being under negative pressure and the air being treated in the odour abatement system (biofilter). There is also an enclosed biofilter for the pasteurisers.
e	Dampening	Due to the hard surfaces throughout the site dust raising is not an issue. However, if there were any emissions of dust observed as part of daily site inspections then dampening would be carried out.

BAT 14	**In order to prevent or, where that is not practicable, to reduce diffuse emissions to air, in particular of dust, organic compounds and odour, BAT is to use an appropriate combination of the techniques given below.**	
f	Maintenance	All plant and equipment are subject to a planned preventative maintenance programme in accordance with: • Piddlehinton AD Site Daily Record Sheet • Daily Checks for mobile plant • Eco Daily Maintenance Schedule
g	Cleaning of waste treatment and storage areas	Cleaning of the Reception Building is carried out in accordance with the Piddlehinton Feedstock Acceptance and Rejection Procedure **(ECO-OP-25):** • *Once unloaded, wash off the back and wheels of the vehicle using the jet washer.* • *Only when vehicle is clean and ready to go the exit door can be opened. It should be ensured that exit door is open for the minimum amount of time.*
h	Leak detection and repair (LDAR) programme	A Leak Detection and Repair (LDAR) programme will be developed to measure diffuse emissions of ammonia, VOCs including methane and odour from all sources identified in the LDAR. Currently, thermal imaging every 6 months to check for heat loss which may also indicate gas loss.

Emissions from Flaring

BAT 15	**BAT is to use flaring only for safety reasons or for non-routine operating conditions (e.g. start-ups, shutdowns) by using both of the techniques given below.**	
a	Correct plant design. This includes the provision of a gas recovery system with sufficient capacity and the use of high-integrity relief valves.	There is 975m^3 of biogas storage in each of the two digesters, therefore providing a total of 1,950m^3 of biogas storage. The theoretical maximum production is 400m^3 per hour per digester so 800m^3 per hour. Therefore the gas storage capacity allows for approximately 2.4 hours of production. However, as the site operates with 4 No. CHPs, planned maintenance can be staggered to minimise flaring. In addition, feed rates are reduced ahead of longer periods of maintenance to reduce gas production. Biogas is not routinely flared to atmosphere. The flare is only used during periods of extended CHP maintenance and during abnormal operating conditions should the biogas storage become full. The under and over pressure valve can be adjusted at a max. overpressure of 5 mbar and a max. under pressure of -1 mbar. The PRV lifts at pressures exceeding 0.01 mbar. The flare starts at >100% gas pressure indication. The settings ensure that the flare ignites prior to any gas venting through the PRVs. Digesters (D1 and D2) line wire gas level indicator sends a signal to SCADA which is then converted to a % level reading. A High gas level indication automatically triggers the start of the flare and if flare fails to start then SMS alert message is sent to the duty operator. Flaring is a more favourable environmental outcome than release of raw biogas through pressure relief valves. Venting is used only in extreme circumstances as a precautionary approach to prevent catastrophic pressure build up within the system. Both are minimised as much as possible by monitoring and efficient operation of the site.
b	Plant management. This includes balancing the gas system and using advanced process control.	Gas volume is monitored and regulated through process monitoring. The process is monitored and controlled in accordance with PAS110 SOPs **(ECO-OP-11)** and resulting process management which include regulation of feed rates and monitoring of dry matter content and biochemical methane potential of feedstocks.

BAT 15	**BAT is to use flaring only for safety reasons or for non-routine operating conditions (e.g. start-ups, shutdowns) by using both of the techniques given below.**	
BAT 16	**In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use (both of) the techniques given below.**	
a	Correct design of flaring devices. Optimisation of height and pressure, assistance by steam, air or gas, type of flare tips, etc., to enable smokeless and reliable operation and to ensure the efficient combustion of excess gases.	The flare is a UF10-800 High Temperature Enclosed Biogas Flare manufactured by Uniflare. It is suitable for 800 Nm^3hr Biogas. In line with BAT the flare burns at >1,000^oC for in excess of 0.3 seconds.
b	Monitoring and recording as part of flare management. This includes continuous monitoring of the quantity of gas sent to flaring. It may include estimations of other parameters (e.g., composition of gas flow, heat content, ratio of assistance, velocity, purge gas flow rate, pollutant emissions (e.g., NO_X, CO, hydrocarbons), noise). The recording of flaring events usually includes the duration and number of events and allows for the quantification of emissions and the potential prevention of future flaring events.	The number of operating hours for the flare is recorded on the SCADA System and this information will be submitted to the Environment Agency annually in accordance with the varied Environmental Permit. The flare incorporates a Digital Flow Transmitter to allow monitoring of the flow of gas to the flare. It is in economic interests of Eco Sustainable Solutions to reduce the amount of biogas lost to flaring and to conduct a root cause analysis to reduce the potential for future flaring events.

Noise & Vibration

BAT 17	**In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to set up, implement and regularly review a noise and vibration management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:**	
	A protocol containing appropriate actions and timelines;	The applicability of BAT 17 is restricted to cases where a noise or vibration nuisance at sensitive receptors is expected and/or has been substantiated. The Operator has confirmed that no noise complaints have been received and noise nuisance has not been detected. A Noise and Vibration Management Plan will be developed if noise and / or vibration become a nuisance.
	A protocol for conducting noise and vibration monitoring;	As above.
	A protocol for response to identified noise and vibration events, e.g., complaints;	As above.
	A noise and vibration reduction programme designed to identify the source(s), to measure/estimate noise and vibration exposure, to characterise the contributions of the sources and to implement prevention and/or reduction measures.	As above.

BAT 18	**In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to use one or a combination of the techniques given below.**	
a	Appropriate location of equipment and buildings. Noise levels can be reduced by increasing the distance between the emitter and the receiver, by using buildings as noise screens and by relocating building exits or entrances.	Whilst there are sensitive receptors within Bourne Park within proximity to the site, these are workplaces and also sources of noise. The closest residential receptor to the site is The Granary approximately 136m to the north west of the site. Two of the four CHPs are partially screened from this receptor via the Reception Building.
b	Operational measures. This includes techniques such as: • inspection and maintenance of equipment; • closing of doors and windows of enclosed areas, if possible; • equipment operation by experienced staff; • avoidance of noisy activities at night, if possible; • provisions for noise control during maintenance, traffic, handling and treatment activities.	Operational measures to reduce noise emissions include: • Planned preventative maintenance of plant and equipment including the flare and the CHPs. • Only trained staff are able to operate equipment. • The planning permission restricts delivery of waste to the site between the following hours: o 07.00 to 17.00 Monday to Friday o 07.00 to 13.00 Saturday o No HGV movements shall take place on Sundays or Bank Holidays. • There is a 5mph speed limit on site.
c	Low-noise equipment. This may include direct drive motors, compressors, pumps and flares	The Enclosed Thermal Combustor of the flare reduces noise emissions.
d	Noise and vibration control equipment. This includes techniques such as: • noise reducers; • acoustic and vibrational insulation of equipment; • enclosure of noisy equipment; • soundproofing of buildings.	The CHPs are housed in sound proofed containers.

BAT 18	**In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to use one or a combination of the techniques given below.**	
e	Noise attenuation. Noise propagation can be reduced by inserting obstacles between emitters and receivers (e.g., protection walls, embankments and buildings).	See Bat 18a above

Emissions to Water

BAT 19	**In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that is not practicable, to reduce emissions to soil and water, BAT is to use an appropriate combination of the techniques given below.**	
a	Water management. Water consumption is optimised by using measures which may include: • water-saving plans (e.g., establishment of water efficiency objectives, flow diagrams and water mass balances); • optimising the use of washing water (e.g., dry cleaning instead of hosing down, using trigger control on all washing equipment);	Water is abstracted from an on-site borehole as there is no mains water connection on site. Due to the low dry matter content of the feedstock mix and the recirculation of rainwater, additional water is generally not required for the process. Water is used to wash down vehicles which have dispatched solid waste inside the Reception Building. This water use is minimised via the use of trigger control hoses. All of the water collecting within the sump in the Reception Building is pumped to the Buffer Tanks for use in the AD process. Water collected within the secondary containment sump, if clean may be diverted to the Firewater Storage Bladder for storage / future use if required.
b	Water recirculation	As described above the recirculation of clean and dirty water is optimised.
c	Impermeable surface. Depending on the risks posed by the waste in terms of soil and/or water contamination, the surface of the whole waste treatment area (e.g., waste reception, handling, storage, treatment and dispatch areas) is made impermeable to the liquids concerned.	The whole site, both clean and dirty areas, benefit from an impermeable concrete surface. The Reception Building benefits from a sealed drainage system from which dirty water is collected, stored in the Buffer Tanks and reused in the process.
d	Techniques to reduce the likelihood and impact of overflows and failures from tanks and vessels. Depending on the risks posed by the liquids contained in tanks and vessels in terms of soil and/or water contamination, this includes techniques such as: • overflow detectors;	All the tanks benefit from high level sensors and alarms and are connected to SCADA as detailed below: • The digesters (D1 and D2) benefit from pressure liquid level indicators which send a signal to SCADA which then converts the signal to a % level reading. The tanks are also equipped with inductive high level liquid sensor that is safety interlocked to automatically STOP feeding the digester with feedstock blend from the buffer tank when the high liquid level is indicated. This then triggers an

BAT 19	**In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that is not practicable, to reduce emissions to soil and water, BAT is to use an appropriate combination of the techniques given below.**	
	• overflow pipes that are directed to a contained drainage system (i.e., the relevant secondary containment or another vessel); • tanks for liquids that are located in a suitable secondary containment; the volume is normally sized to accommodate the loss of containment of the largest tank within the secondary containment; • isolation of tanks, vessels and secondary containment (e.g., closing of valves).	alert SMS alert message to be sent to the duty operator via the SCADA duty planner. • Buffer tanks (B1 and B2) are equipped with ultra-sonic level indicators that send mA signal to the SCADA. When high level indication is seen this then triggers SMS alert message to the duty operator. The Haarslev system is not in operation when operators are not on site. • Digestate storage tank is equipped with a high-level float switch that sends current when closed to the SCADA indicating a high level condition within the tank. This then stops the pasteurisation process via safety interlock. The stoppage of the pasteurisation process then triggers an alert SMS alert message to be sent to the duty operator via the SCADA duty planner. • Milk washings tanks are equipped with a high liquid level sensors that sends signal to the Haarslev control system that triggers an audible alarm when the tank high level is indicated. Again the Haarslev system is not in operation when operators are not on site. The containment capacity is in accordance with CIRIA C736, with the calculations demonstrating that the secondary containment capacity is greater than 110% of the largest tank (25% of the combined tank volume is less than 110% of the largest tank). This is based on an assumption that the digestate storage tank is filled to a level of 3.93m which equates to a volume of 4,053m^3. However, the freeboard requirement is found not to meet CIRIA C736. It is for this reason that the volume in the digestate storage tank has been limited to 3.93m in the interim until improvements to the secondary containment system are completed. A report of the suitability of the secondary containment system with respect to CIRIA C736 was commissioned in July 2022 and forms a supporting document to the current permit variation application.[2] The process of management of water collecting within the secondary containment sump is such that daily checks are carried out on the level in the drainage sump and if there is

[2] Preliminary review of AD Plant Secondary Containment, 8060-001-R-01, Key GS, July 2022

BAT 19	**In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that is not practicable, to reduce emissions to soil and water, BAT is to use an appropriate combination of the techniques given below.**	
		liquid in the sump then the manually operated pump is used to pump the liquid to either the liquid waste tanks or pre-tanks or the fire water bladder (if required and clean).
e	Roofing of waste storage and treatment areas	All waste storage and treatment is carried out in the Reception Building or within the enclosed AD plant infrastructure thus reducing production of dirty water.
f	Segregation of water streams	The site has been designed with segregation of clean and dirty water. The Reception Building is always designated as dirty. The secondary containment bund is normally clean but all water is collected within sumps and can be diverted to dirty if a spillage occurs.
g	Adequate drainage infrastructure. The waste treatment area is connected to drainage infrastructure. Rainwater falling on the treatment and storage areas is collected in the drainage infrastructure along with washing water, occasional spillages, etc. and, depending on the pollutant content, recirculated or sent for further treatment.	As previously described the waste storage and treatment area benefits from a building and an appropriate drainage arrangement; all dirty water is reused in the process.
h	Design and maintenance provisions to allow detection and repair of leaks. Regular monitoring for potential leaks is risk-based, and, when necessary, equipment is repaired. The use of underground components is minimised. When underground components are used, and depending on the risks posed by the waste contained in those components in terms of soil and/or water contamination, secondary containment of underground components is put in place.	Pipework going to from the bunded area is underground but above the bentonite layer, buried under shingle. The pipework is as per original vender specification solvent fixed PVC pipe work single continuous HDPE pipe without any underground junctions. It is 8 inches in diameter and uses a secure fusion welding jointing system. There is an underground drainage sump within the containment area which pumps out to the liquid waste tanks within the Reception Building. As noted in the Key GS report: *All pipework and services run within a trench system which has been fully- lined with GCL, or over the surface of sidewalls, and there are no known breaches through the base or perimeter sidewall of the secondary containment area. Any leakages from buried pipework would be noted in the sump. The current arrangement is deemed to be acceptable and compliant with the general requirements of the European Commission BAT report.*

BAT 19	**In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that is not practicable, to reduce emissions to soil and water, BAT is to use an appropriate combination of the techniques given below.**	
i	Appropriate buffer storage capacity is provided for waste water generated during other than normal operating conditions using a risk-based approach (e.g. taking into account the nature of the pollutants, the effects of downstream waste water treatment, and the receiving environment). The discharge of waste water from this buffer storage is only possible after appropriate measures are taken (e.g., monitor, treat, reuse).	Waste water generated during abnormal operating conditions would be stored within the secondary containment systems, the sizing and suitability of which have been described in preceding sections.

BAT 20 – not applicable (waste water treatment)

Emissions from Accidents and Incidents

BAT 21	**In order to prevent or limit the environmental consequences of accidents and incidents, BAT is to use all of the techniques given below, as part of the accident management plan (see BAT 1)**	
a	Protection measures. These include measures such as: • protection of the plant against malevolent acts; fire and explosion protection system, containing equipment for prevention, detection, and extinction; and • accessibility and operability of relevant control equipment in emergency situations.	The plant can be operated remotely via a secure remote login in system which ensure a direct link to the SCADA system. The site benefits from CCTV monitoring and recording for the process barn, car park, in front of the process barn where tippers come into site. the bund, and weighbridge area. The CCTV can be logged into remotely by site personnel. A DSEAR assessment has been carried out and recommendations for remedial action are being carried out. This ensures appropriate explosion protection measures are in place. A Fire Risk Assessment was carried out in March 2022 and recommended actions are in the process of being undertaken. Fire extinguishers (foam and CO2) are located at various locations throughout the premises.
b	Management of incidental/accidental emissions. Procedures are established and technical provisions are in place to manage (in terms of possible containment) emissions from accidents and incidents such as emissions from spillages, firefighting water, or safety valves	The Piddlehinton Emergency Preparedness Plan **(ECO-EP-03)** contains Standard Operating Procedures for emergency situations: • Fire/Explosion. • Gas Leak – CHP Engines. • Gas Leak – Inside the Building. • Tank Failure. • Electrical Failure. • Mechanical Failure. • Oil/Fuel/Chemical Spillage. • External flood. • Serious Injury. • Lightning Strike.
c	Incident/accident registration and assessment system. This includes techniques such as: • a log/diary to record all accidents, incidents, changes to procedures and the findings of inspections; and • procedures to identify, respond to and learn from such incidents and accidents.	In accordance with the Accident and Incident Reporting and Investigation Management Procedure **(ECO- MP-19)** it is the responsibility of all staff to report incidents, including near misses to their line of report or the Tech EHS Manager as soon as possible. Team Leaders and Line Managers are responsible (with support from the Tech EHS Manager) for undertaking investigations following incidents. The level of investigation will be determined by the severity or potential of the incident, in accordance with the details

		in the Accident and Incident Reporting and Investigation Management Procedure **(ECO-MP-19).** Any changes to procedures are made in accordance with Document Control Procedure **(ECO-MP-01)**.

Material Efficiency

BAT 22	**In order to use materials efficiently, BAT is to substitute materials with waste.**	
a	Waste is used instead of other materials for the treatment of wastes (e.g., waste alkalis or waste acids are used for pH adjustment, fly ashes are used as binders).	The process makes good use of recycled dirty water and liquid waste to create a prepared feedstock in the correct dry matter range for anaerobic digestion. There is limited use of raw materials. The AD process uses primarily waste materials in order to recover biogas and digestate. Raw material use is minimised where possible and use will be reported annually to the Environment Agency in line with permit conditions as required. Opportunities will be sought to use waste materials in place of raw materials.

Energy Efficiency

BAT 23	**In order to use energy efficiently, BAT is to use both of the techniques given below.**	
a	Energy efficiency plan. An energy efficiency plan entails defining and calculating the specific energy consumption of the activity (or activities), setting key performance indicators on an annual basis (for example, specific energy consumption expressed in kWh/tonne of waste processed) and planning periodic improvement targets and related actions. The plan is adapted to the specificities of the waste treatment in terms of process(es) carried out, waste stream(s) treated, etc.	Heat and electricity are provided by the CHP engines except in the case of power failure. Power will then be provided by the on-site stand-by generators (1No. Single phase and 1 No. 3-phase). Heat reuse and distribution is shown on red lines on the Process Flow Diagram (Appendix A). Energy usage is monitored and reviewed annually. Records of primary energy used, energy generated, and energy exported are maintained and an annual return will be made to the EA in accordance with permit requirements under an Installation permit.
b	Energy balance record. An energy balance record provides a breakdown of the energy consumption and generation (including exportation) by the type of source (i.e., electricity, gas, conventional liquid fuels, conventional solid fuels, and waste). This includes: • information on energy consumption in terms of delivered energy; • information on energy exported from the installation; • energy flow information (e.g., Sankey diagrams or energy balances) showing how the energy is used throughout the process. The energy balance record is adapted to the specificities of the waste treatment in terms of process(es) carried out, waste stream(s) treated, etc.	A Sankey Diagram has been developed and forms Appendix B of this document.

Waste Reduction

BAT 24	**In order to reduce the quantity of waste sent for disposal, BAT is to maximise the reuse of packaging, as part of the residues management plan (see BAT 1).**	
	Packaging (drums, containers, IBCs, pallets, etc.) is reused for containing waste, when it is in good condition and sufficiently clean, depending on a compatibility check between the substances contained (in consecutive uses). If necessary, packaging is sent for appropriate treatment prior to reuse (e.g., reconditioning, cleaning).	Packaging removed from packaged waste feedstocks is washed in the process to ensure maximum removal of organic materials. The resulting packaging material is compacted and sent off site to be used in an energy from waste plant which is currently the best option for this waste stream in line with the waste hierarchy. Any IBCs used for e.g., ferric chloride are recycled as current best option in accordance with the waste hierarchy. Ref: Piddlehinton Residue Management Plan **(ECO-MP-25).**

BAT 25-32 Not Applicable (mechanical treatment of waste when it is not combined with biological treatment)

General BAT conclusions for the biological treatment of waste

BAT 33	**In order to reduce odour emissions and to improve the overall environmental performance, BAT is to select the waste input.**	
	The technique consists of carrying out the pre-acceptance, acceptance and sorting of the waste input (see BAT 2) so as to ensure the suitability of the waste input for the waste treatment, e.g., in terms of nutrient balance, moisture or toxic compounds which may reduce the biological activity.	The EMS procedures for waste pre-acceptance and acceptance (see BAT 2) ensure that waste is only accepted at the facility if it is suitable for treatment within an anaerobic digester.

BAT 34	**In order to reduce channelled emissions to air of dust, organic compounds and odorous compounds, including H_2S and NH_3, BAT is to use one or a combination of the techniques given below.**		
a	Adsorption	Not applicable.	
b	Biofilter	The odour abatement system utilises a woodchip biofilter system to treat channelled emissions from the Reception Building. There is also a biofilter for the pasteurisation unit.	
c	Fabric filter	Not applicable.	
d	Thermal oxidation	Not applicable.	
e	Wet scrubbing	Not applicable	
BAT-associated emission levels (BAT-AELs) for channelled NH_3, odour, dust and TVOC emissions to air from the biological treatment of waste			
Ref	**Parameter**	**BAT-AEL (Average over the sampling period)**	
Table 6.7	NH_3 - mg/Nm^3 *	0.3 - 20	Either the BAT-AEL for NH3 or the BAT-AEL for the odour concentration applies. It is proposed that odour monitoring will be carried out.
	Odour concentration - ou_E/Nm^3 *	200 - 1,000	Odour monitoring against this BAT-AEL will be carried out every 6 months in accordance with BAT 8

* Either the BAT-AEL for NH_3 or the BAT-AEL for the odour concentration applies.

BAT 35	**In order to reduce the generation of waste water and to reduce water usage, BAT is to use all of the techniques given below.**	
a	Segregation of water streams	This is detailed within the response to BAT 19.
b	Water recirculation	This is detailed within the response to BAT 19.
c	Minimisation of the generation of leachate	Leachate may be produced from stored food waste stored in the Reception Building, but this is minimised through the short storage times; maximum of 24 hours. All leachate and dirty water are used in the AD process as a feedstock.

BAT 36-37 Not Applicable

BAT conclusions for the anaerobic treatment of waste

Process Monitoring

BAT 38	**In order to reduce emissions to air and to improve the overall environmental performance, BAT is to monitor and/or control the key waste and process parameters.**	
	Implementation of a manual and/or automatic monitoring system to: • ensure stable digester operation, • minimise operational difficulties, such as foaming, which may lead to odour emissions, • provide sufficient early warning of system failures which may lead to a loss of containment and explosions. This includes monitoring and/or control of key waste and process parameters, e.g.: • pH and alkalinity of the digester feed; • digester operating temperature; • hydraulic and organic loading rates of the digester feed; • concentration of volatile fatty acids (VFA) and ammonia within the digester and digestate; • biogas quantity, composition (e.g., H_2S) and pressure; • liquid and foam levels in the digester.	The following process monitoring takes place: ***Continuous monitoring (recorded on SCADA):*** 1. Gas production 2. Gas pressure 3. Gas volume 4. Temperature ***Daily Process Monitoring:*** 5. Odour at site boundary and main potential odour sources 6. Gas readings (CH_4, H_2S and O_2) – automated system which records gas quality every 6 hours prior to each set of 2 CHPs. The results are shown on SCADA. 7. Visual check on appearance and level of digesters (crust, foam, mixing speed) ***On-site testing:*** 8. The on-site testing equipment is used to test: • FOS/TAC in digesters on a weekly basis • pH and dry matter in digesters on a weekly basis • Dry matter testing of the buffer tanks on a weekly basis • Feedstock testing - dry matter content, pH and chlorides ***Samples for laboratory testing:*** 1. Feedstock - chlorides and bullet biochemical methane potential. 2. A sample is taken from each of the digesters approximately quarterly and sent off for analysis including: • pH • FOS/TAC • Dry matter • Ammonia • Volatile fatty acid speciation • Trace elements

BAT 38	**In order to reduce emissions to air and to improve the overall environmental performance, BAT is to monitor and/or control the key waste and process parameters.**	
		Additional samples are taken from the supply to the digestate store to undertake analysis in accordance with PAS110/ADQP requirements (generally, monthly). Frequency of testing is increased if required to enhance process monitoring around abnormal operation events. Process monitoring data is used by the AD Manager to inform process decisions including the feed plan, mixing regime and the addition of trace elements.

BAT 39-53 Not applicable (other waste treatment activities)

3. Conclusions and Recommendations

The BAT review has highlighted that proposals are generally compliant with indicative BAT as stated in Best Available Techniques Reference Document for Waste Treatment.[1] However, some areas for improvement in line with BAT have been identified and as a result Eco Sustainable Solutions is carrying out the following actions as part of continual improvement of site operations.

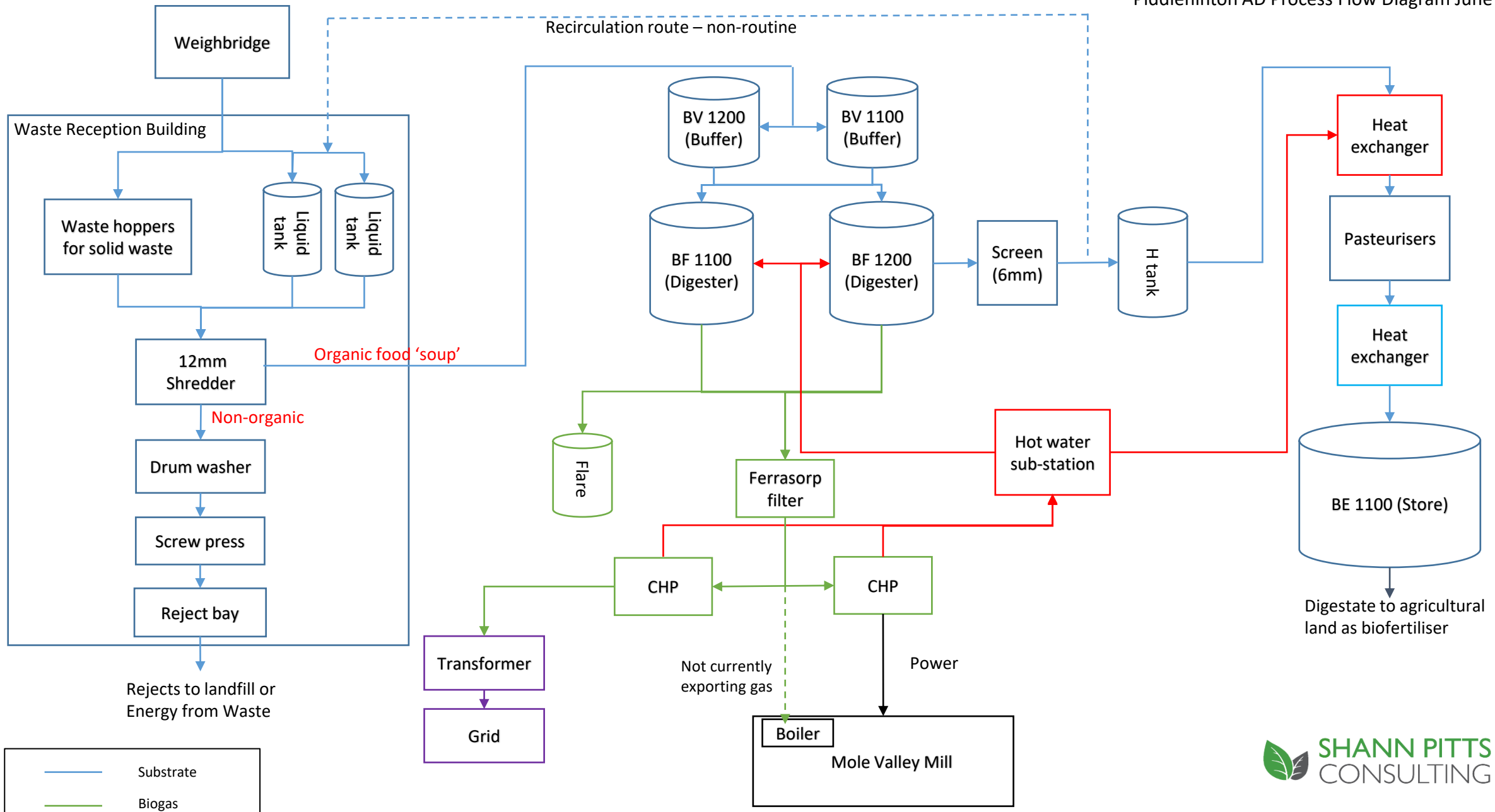
In accordance with **BAT 8** and **BAT 34** the emissions from the biofilters will be monitored for odour concentration every six months. The monitoring will be carried out by an MCERTS contractor in accordance with EN standard EN 13725. The emission test results will be compared to the BAT-AEL stated within BAT 34 and actions taken, as required, to comply within the odour concentration BAT-AEL.

In accordance with **BAT 14 (h)**, a Leak Detection and Repair (LDAR) programme will be developed to measure diffuse emissions of VOCs including methane.

In accordance with **BAT 16** a BAT complaint enclosed flare has been ordered and is expected to be commissioned within 6 months of placing order i.e. by 1st August 2023.

Appendix A - Process Flow Overview

Piddlehinton AD Process Flow Diagram June 2022



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Appendix B – Sankey Diagram

Piddlehinton AD Sankey Diagram V1.0 December 2022