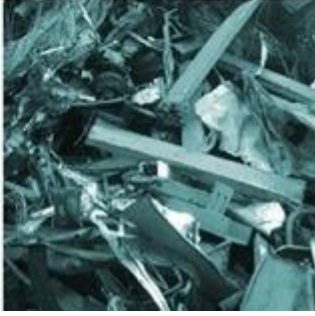
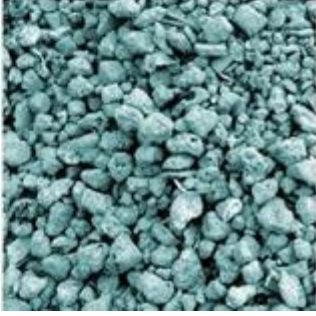
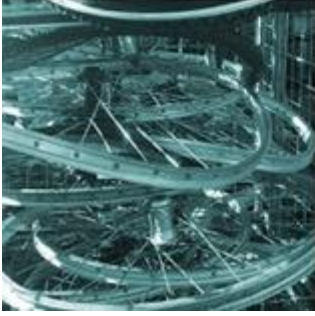


BIO DYNAMIC UK LIMITED PERMIT VARIATION APPLICATION

BAT Assessment

July 2022



Client: Bio Dynamic UK Limited
Document Reference: HC1677-11

REPORT SCHEDULE

Operator: Bio Dynamic UK Limited

Client: Bio Dynamic UK Limited

Project Title: Bio Dynamic UK Limited Permit Variation Application

Document Title: BAT Assessment

Document Reference: HC1677-11

Report Status: Final 1.2

Project Director: Joanna Holland

Project Manager: Jo Chapman

AUTHOR	DATE
Jo Chapman	15 th July 2022
REVIEWER	
Joanna Holland	13 th August 2022
APPROVED	
Joanna Holland	13 th August 2022

REVISION HISTORY	DATE	COMMENTS	APPROVED
Final Version 1.0	19 th August 2022	For submission to EA	Maxwell Bagnall
Final Version 1.1	24 th April 2023	Update site configuration	Maxwell Bagnall
Final Version 1.2	6 th June 2023	Update reference to current EA guidance. Further reference to waste storage, treatment and transfer activity and update to reflect minor changes since original application submission.	Maxwell Bagnall

DISCLAIMER

This report has been prepared by H&C Consultancy Ltd with all reasonable skill, care and diligence. It has been prepared in accordance with instructions from the client and within the terms and conditions agreed with the client. The report is based on information provided by the Client and our professional judgment at the time this report was prepared.

The report presents H&C Consultancy's professional opinion and no warranty, expressed or implied, is made.

This report is for the sole use of The Client, and H&C Consultancy Ltd shall not be held responsible for any user of the report or its content for any other purpose other than that for which it was prepared and provided to the client. H&C Consultancy accepts no liability to third parties.

CONTENTS

1. INTRODUCTION	3
2. SITE SETTING, SURROUNDING LAND USE, AND LOCATION OF RECEPTORS.....	5
3. FEEDSTOCK ACCEPTANCE PROCEDURES.....	7
4. TREATMENT.....	13
5. BIOGAS TREATMENT AND STORAGE.....	21
6. ENERGY RECOVERY	24
7. DIGESTATE TREATMENT AND STORAGE	25
8. EMISSIONS CONTROL AND ABATEMENT.....	27
9. MANAGEMENT	31
10. MONITORING	33
11. IMPACT	36

APPENDICES

Appendix 1	Feedstock Pre-Acceptance Procedure
Appendix 1a	Notes to Accompany Pre-Acceptance Procedure
Appendix 2a-c	Feedstock Acceptance and Rejection Procedures
Appendix 3	Digester Inspection and Maintenance Report
Appendix 4	Design, Construction and Sizing of Bund
Appendix 5	Process Monitoring Plan
Appendix 6	Specification of New Additional Flare
Appendix 7	Specification for New CHP Engines
Appendix 8	Data Sheet for New Dual Fuel Boiler
Appendix 9	HAZOP Report
Appendix 10	DSEAR Assessment Report
Appendix 11	Hazardous Areas Plans
Appendix 12	Scada System Alarm List Screen Dump
Appendix 13	Specification for Odour Abatement Systems

1. INTRODUCTION

1.1. Introduction

- 1.1.1. The Bio Dynamic UK Limited Anaerobic Digestion (AD) Facility is an AD plant which produces biogas for use for, gas upgrading and combined heat and power facilities at Private Road No. 4, Colwick Industrial Estate, NG4 2JT, NGR SK 63425 39835.
- 1.1.2. The plant has been operational under an environmental permit reference EPR/DP3935ER since 2014 and has recently commenced a major site refurbishment to both increase processing capacity at the site, and uplift site infrastructure in line with current Best Available Techniques (BAT).
- 1.1.3. During refurbishment of the facility the applicant commits to ensure that all relevant and required aspects of the current EA technical guidance are applied. At the time that this assessment was originally written, guidance 'How to comply with your Environmental Permit. Additional Guidance for: Anaerobic Digestions' (LIT 8737, v1.0 Nov 2013) and European Commission document JRC Science for Policy Report – Best Available Techniques (BAT) Reference Document for Waste Treatment, Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control), Pinasseau et.al 2018 were used as reference documents for this assessment. Since the application has subsequently been approved following finalisation of component documents and placed on a waiting list for allocation to an assessing officer, new guidance on appropriate measures for biological treatment of waste have been published on the EA's website. The former 'How to comply with your Environmental Permit. Additional Guidance for: Anaerobic Digestions' (LIT 8737, v1.0 Nov 2013)' has therefore been superseded. This BAT assessment has subsequently been reviewed and where relevant updated to ensure it applies in the light of the more recently published 'Biological waste treatment: appropriate measures for permitted facilities', 21 September 2022, GOV.UK.
- 1.1.4. The refurbished operation is designed to process up to 150,000 tonnes of waste per year received as either packaged or unpackaged solid wastes, or pumpable liquid wastes. Approximately 20,000tpa of these wastes will be de-packaged and stored for a short-term period prior to being exported offsite for use as feedstock in other AD plant operations. The remaining 130,000tpa will be used as feedstock for the onsite AD process. This equates to a daily processing capacity through the onsite AD treatment process of approximately 356 tonnes per day, a daily processing capacity for the treatment, storage and transfer operation of approximately 55 tonnes per day, and a whole site operations daily processing capacity of 411 tonnes per day. All solid feedstocks will be received at the site in the main reception building, which will house storage and de-packaging facilities. Liquid waste delivery and offtake points will be located outside the building, deliveries being made to one of several bunded pre-storage tanks. Liquid digestate removal points are located outside with dedicated drain down and containment facilities to manage spillages. Feedstocks will be passed forward via a closed pumping line for treatment, firstly via one of two pasteurisation units, and then to anaerobic digestion in primary and secondary digesters. Biogas will be stored in gas bags in the head space of the digesters before being upgraded to biomethane

for injection into the national gas grid network at the adjacent BD Gas Permits Biogas Upgrading Facility (permit reference EPR/KP3707LX) or used in one of four onsite CHP engines to generate electricity. The site is also fitted with a dual fuel diesel/biogas boiler which will operate using biogas produced at the site to produce heat for the process as a backup contingency measure. The boiler will only operate on diesel during emergency or atypical site operations.

- 1.1.5. The site incorporates two emergency, fully automatic closed (ground) back-up flares for the burning of biogas, pasteurisation tanks for treatment of waste and production of digestate to PAS110 standard and APHA requirements, and a scheduled phase 2 development to install a further post digestion and digestate storage tank.
- 1.1.6. In accordance with Industrial Emissions Directive 2010 the facility will be operating as an installation under a bespoke Environmental Permit. It is a requirement of the IPPC permitting regime that Operators must apply Best Available Techniques. This report has been written with reference to 'Biological waste treatment: appropriate measures for permitted facilities', 21 September 2022, GOV.UK, and European Commission document JRC Science for Policy Report – Best Available Techniques (BAT) Reference Document for Waste Treatment, Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control), Pinasseau et.al 2018. This report provides an assessment and demonstration of how these standards have been applied/will be applied at the Bio Dynamic UK Limited AD site once the facility is fully operational. Reference has also been made to guidance relating to the permitting requirements for Medium Combustion Plant published on the GOV.UK web pages.

2. SITE SETTING, SURROUNDING LAND USE, AND LOCATION OF RECEPTORS

2.1 Site Setting, Surrounding Land Use, and Location of Receptors

- 2.1.1 The site is located at the eastern end of the north side of Private Road No. 4, Colwick Industrial Estate, NG4 2JT, NGR SK 63425 39835, and extends to approximately 1.4 ha in area. There are no protected ecological sites within the relevant screening distances from the facility.
- 2.1.2 The site is in a predominantly industrial area on land which was formerly in use as railway sidings, approximately 150m north of the river Trent. There are several permitted waste operations in the general surrounding locations of the Colwick industrial estate, and the site is immediately adjacent to the B D Gas Permits Limited biogas upgrading facility which is a directly associated activity to the Bio Dynamic UK Limited AD facility.
- 2.1.3 The site is in an area designated as a Secondary A aquifer at the superficial geological level and a secondary B aquifer at the bedrock level. There are several groundwater and surface water abstractors in the area, and the site is located in a groundwater source protection zone 3.
- 2.1.4 There are no designated habitats sites within 2km of the site. There are several locally designated nature reserves and priority habitat areas within 100m and 200m of the site. The area is predominantly industrial in character, the nearest local residential properties located approx. 730m to the southwest and 860m to the southeast.
- 2.1.5 Further details of receptors can be found in the environmental risk assessment associated with the Bio Dynamic UK Limited permit variation application at document HC1677-08.
- 2.1.6 The site and its setting are shown below in Figure 1, and the site layout in Figure 2.

Figure 1. The Site and its Setting

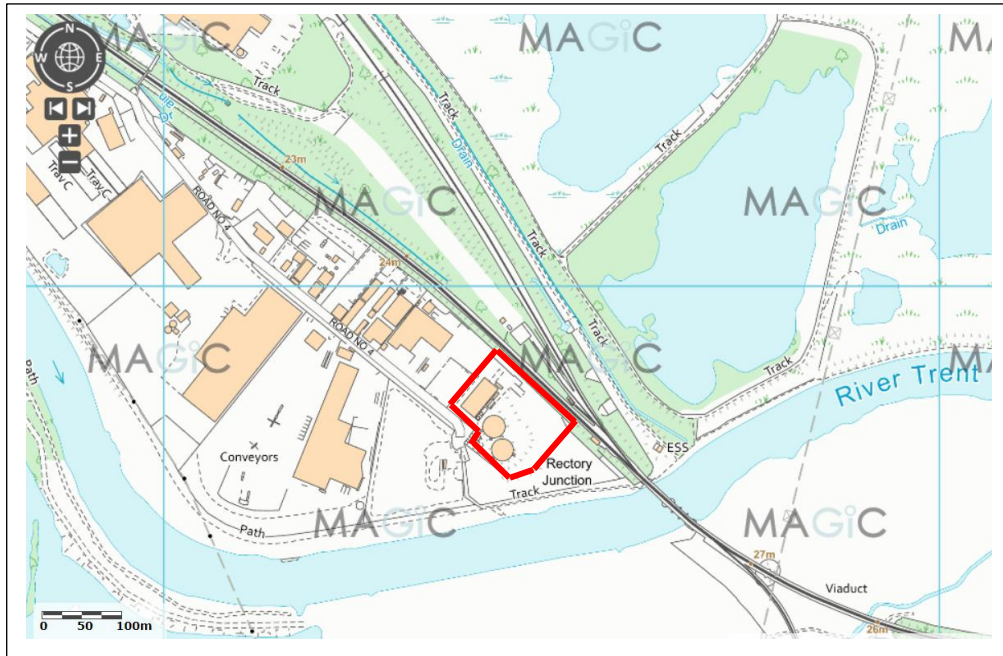
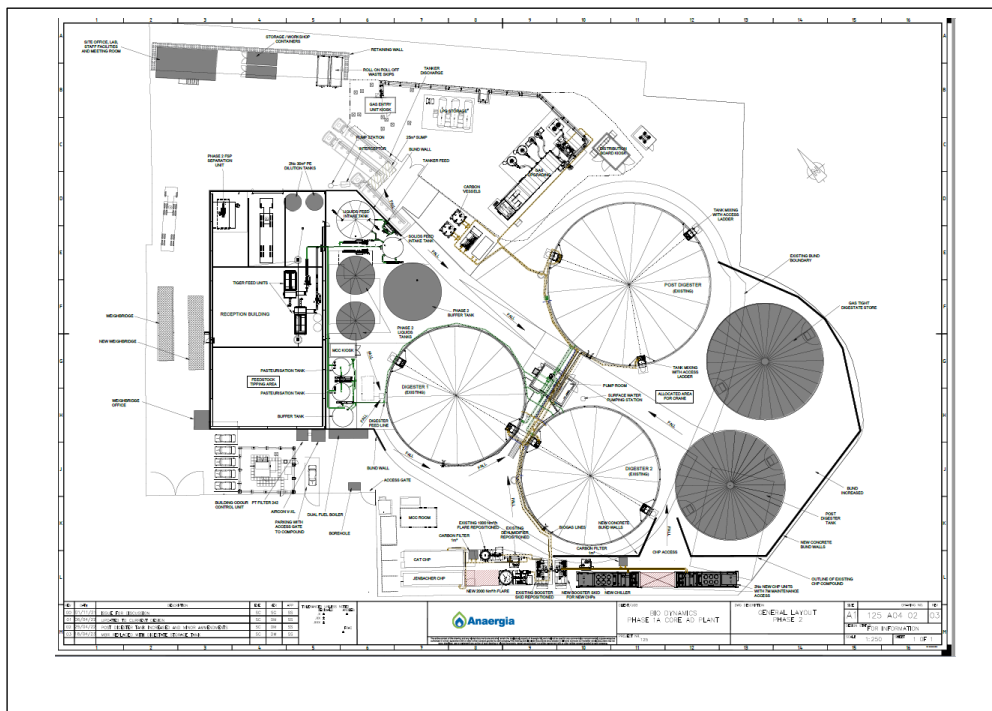


Figure 2. Site Layout (HC1677 -06d)



3. FEEDSTOCK ACCEPTANCE PROCEDURES

3.1 Feedstock Pre-Acceptance

- 3.1.1 The whole site operation is designed to process up to 150,000 tonnes of waste per year received as either packaged or unpackaged solid wastes, or pumpable liquid wastes. Approximately 20,000tpa of these wastes will be de-packaged and stored for a short-term period prior to being exported offsite for use as feedstock in other AD plant operations. The remaining 130,000tpa will be used as feedstock for the onsite AD process. This equates to a daily processing capacity through the onsite AD treatment process of approximately 356 tonnes per day, a daily processing capacity for the treatment, storage and transfer operation of approximately 55 tonnes per day, and a whole site operations daily processing capacity of 411 tonnes per day. Wastes will be provided by the feedstock supplier according to the terms of a feedstock supply agreement.
- 3.1.2 Sourcing and proportional selection of feedstocks suitable for Anaerobic Digestion in the AD plant are identified carefully, with consideration of aspects that will impact on the operation of the digestion process, and potential for gas production. The operator has established a waste pre-assessment procedure for assessment of suitability of wastes prior to receipt at the site. This process remains unchanged as a result of the current site refurbishment. The operator has included assessment of odours as part of the pre-assessment procedure.
- 3.1.3 The waste storage, treatment and transfer activity at the site is intended to produce feedstock for PAS110 compliant AD facilities. The waste storage, treatment and transfer activity takes place in the same reception, storage and treatment facilities as the wastes processed in the AD plant which no separation of materials intended for the various end uses. Therefore, all wastes received at the site intended to be either processed in the AD facility, or transferred off site for use in other AD plants, will be subject to the same pre-assessment, acceptance, storage, treatment and handling standards. The list of wastes that can be accepted for the two activities will be identical.
- 3.1.4 In accordance with the PAS110 standard, a pre-service agreement will be in place for all feedstock providers prior to receipt of materials onto the site. This agreement will outline any parameters that are required for feedstocks to be accepted on site, and the procedures that will be followed if feedstocks are found to be outside the agreed parameters on receipt. These parameters will include but not be limited to potential levels of contamination of feedstock (e.g., wood, glass, soil, sand, plastics, inhibiting substances etc.), required standards for transportation methods of feedstocks, and provision of suitable documentation and labelling to accompany the load. The process for waste acceptance and pre-acceptance at the site and feedstock types to be accepted has not changed as a result of the current site refurbishment and remains unchanged since assessed in previous applications.
- 3.1.5 All supplier pre-service agreements will be subject to a documented review once a year to ensure that any changes in the suitability, status or handling methodology of the feedstock and can be monitored and detected. All information collated during annual reviews will be retained in the AD plant records for a minimum of two years and updated on at least an annual basis.

- 3.1.6 A copy of the **pre-acceptance procedure and associated notes** are attached as **appendices 1 and 1a**.

3.2 Feedstock Acceptance Procedures

- 3.2.1 Feedstocks will be delivered to site via bulk or curtain sided trailers or tankers and delivered to the main waste reception and storage building.
- 3.2.2 Feedstocks will be received at the site in line with the EMS **Feedstock Acceptance and Rejection Procedures** which are included with this application as **appendix 2a -c**.
- 3.2.3 The feedstock acceptance procedure is largely unchanged following the site refurbishment. The addition of a second weighbridge at the site will allow the operator to manage increased vehicle movements efficiently with a dedicated 'in' and 'out' weighbridge.
- 3.2.4 Each load to be accepted at the site is assigned a unique reference to allow the load to be 'tracked' throughout the receipt, storage and introduction to processing.
- 3.2.5 Solid wastes will be tipped in the main reception building and stored in a series of concrete reception bays pending further processing.
- 3.2.6 Tankers carrying liquid feedstocks will hook up to a tanker coupling point located outside of the reception building and discharge to the liquid feed intake tank. This is a newly installed 400m³ capacity glass coated steel tank located in a bunded area.
- 3.2.7 The main reception building has been fitted with new fast shutting roller shutter doors which will be closed during vehicle offloading. The waste reception building has been refurbished to create a sealed area that will contain wastes and exclude pests in accordance with APHA requirements. The concrete floor has been re-laid, a new internal drainage system with collection sumps installed, and equipment in the reception building refurbished and re-organised to optimise the use of space. New concrete storage bays have been installed and the macerator which was formerly located in the building replaced with a new unit which is located outside.
- 3.2.8 The operator has been issued an APHA approval for the site which reflects the fact that the APHA local officers are satisfied with the uplift of infrastructure in the reception area. This approval covers treatment of wastes for processing in the AD process and for short term storage, processing and transfer of wastes offsite. A diagram of the new waste reception building layout and drainage is included with this application as HC1677-06e.
- 3.2.9 Liquid wastes and processed solid wastes that has been processed to form a pumpable liquid will be stored in one of a number of tanks that are new, re-purposed tanks that have been installed at the site. The storage tanks are shown on the site layout plan submitted with this variation application reference HC1677-06d.
- 3.2.10 Table 1 below provides a summary of the newly installed/intended storage and process tanks at the site following the recent and imminent refurbishment or as intended in future refurbishment.

Table 1 Summary of New Processing and Storage Tanks

Tank and Status	Capacity in m ³	Tank Construction Material
Liquid Feeds Intake Tank (installed)	400	Glass coated steel tank in concrete bunded area
Solids Feed Intake Tank (installed)	150	Glass coated steel tank in concrete bunded area
Phase 2 liquid tank 1 (To be installed short to medium term)	400	Glass coated steel tank in concrete bunded area
Phase 2 liquid tank 2 (To be installed short to medium term)	400	Glass coated steel tank in concrete bunded area
Phase 2 buffer tank (To be installed short to medium term)	1000	Glass coated steel tank in concrete bunded area
Pasteuriser 1 (Installed)	68	Stainless steel tank in concrete bunded area
Pasteuriser 2 (Installed)	50	Stainless steel tank in concrete bunded area
Buffer tank (Installed)	188	Stainless steel tank in concrete bunded area
Water harvesting tank (Installed)	30	Polyethylene tank inside main reception building
Water harvesting tank (Installed)	30	Polyethylene tank inside main reception building
Digestate Store (phase 2 yet to be installed medium to long term)	TBC	Concrete tank in main process area concrete bund – with gas storage roof and associated bund extension
Post Digester (phase 2 yet to be installed medium to long term)	TBC	Concrete tank in main process area concrete bund – with gas storage roof and associated bund extension

Image 1: New Glass Coated Steel Waste Storage Tanks

- 3.2.11 All waste reception tanks are fitted with high level sensors and alarm systems to detect when a set level is reached. When the sensor is triggered an auditory alarm and visual beacon are triggered to indicate to operator that the tank is full and to prevent over filling.
- 3.2.12 All loads of feedstock arriving at the site by tanker or trailer will be pre-booked, so their arrival is anticipated, and so that feedstock blending, storage and planning can take place to enable optimum plant operation. It also ensures that there is the facility for workload planning and will ensure that loads are only accepted on the site where there is enough storage and treatment capacity to accommodate the incoming load.
- 3.2.13 The feedstock material will arrive on site in tankers or bulk trailers via the weighbridge. Initial checks will be carried out by the weighbridge operator before the vehicle can proceed to be weighed on the weighbridge. The checks undertaken are outlined in the Feedstock Acceptance Procedure, and will include checks of documentation, the nature of the load, the nature of the vehicle delivering the load, and the presence of suitable load labelling where relevant. When the load is weighed on the weighbridge it will be allocated a unique reference number specific to that load. This will create a unique record of the load and the specific details associated with it. Details of the load can then be recorded under this unique code for tracking purposes, such as date and time of delivery, which reception area the delivery was made to, tonnages received, and any associated additional data generated or received during acceptance procedures. The vehicle will be directed to proceed to the correct delivery area by the weighbridge operator once staff in the reception area are ready to receive the vehicle.
- 3.2.14 An operative will supervise all offloading operations at the site. Offloading will be stopped at any point if feedstocks are found to be outside the parameters outlined in the pre-service agreement for the site and waste acceptance criteria. In this instance, the feedstock quarantine and rejection procedure outlined in the operator's Environmental Management System (in accordance with pre-

service agreements) will be instigated. A documented record will be kept of all feedstocks rejected from the site, the reasons for the rejection of the load, and any resulting subsequent actions taken.

- 3.2.15 The outdoor liquid feedstock pre-storage tanks will be situated within the bunded area on site. This bund will be constructed of impermeable concrete, will be constructed to a suitable specification to contain any spillages arising from the site, and sized to contain at least 110% of the largest vessel or 25% of the total tankage volume. Further details of the construction, maintenance and sizing of this bund are given in section 8 of this document.
- 3.2.16 Wheel washing facilities will be available in the delivery shed area, as will foot dips for use in case of spillages of ABP wastes.
- 3.2.17 Documentation relating to incoming feedstocks and feedstocks transferred offsite for use at other AD facilities will be retained for at least 6 years for loads received, rejected and exported from the site. Quarterly waste tonnage returns will be made to the Environment Agency as required for regulatory compliance. In the event that no waste has been received on site as a feedstock, a nil return will be made. An ongoing record of total feedstock tonnages will be kept for compliance monitoring.

3.3 Feedstock Storage and Handling Prior to Digestion

- 3.3.1 The anticipated average residency times of feedstocks on site prior to use or transfer is 1-2 days.
- 3.3.2 Packaged feedstocks are loaded into the Tiger de-packaging machine situated in the waste reception shed via a front-loading shovel. There has been a change in the equipment used in the reception shed to process food wastes. The former 'Tiger' de-packaging machine has been refurbished and will continue to be in use. The 'Attritor' that was previously located in the shed and used for processing has been removed and is no longer in use at the site. The shed also previously housed a waste holding tank, pre-heat tank and two pasteurisers. All of these tanks have been removed from the building. A second Tiger de-packaging machine identical to the one currently in will be installed in the shed meaning there will be two de-packaging lines in the shed.
- 3.3.3 Processed feedstocks will be passed through a macerator which includes a stone trap for retention of physical contaminants to the external storage tanks and to the pasteurisation vessels prior to digestion.
- 3.3.4 Processed feedstocks that are intended for offsite transfer for use at other AD facilities will be loaded from the liquid feed intake or buffer tanks into tankers at the tanker loading area and taken offsite.
- 3.3.5 All new plant and equipment will be subject to testing and sign off as part of the plant commissioning plan overseen by a suitably qualified commissioning engineer.

BAT Assessment Statement:

The infrastructure and processes and procedures that will be implemented to evaluate and manage incoming feedstocks will be compliant with BAT as outlined in 'Biological waste treatment: appropriate measures for permitted facilities', 21 September 2022, GOV.UK .

The required measures outlined in '*Best Available Techniques (BAT) Reference Document for Waste Treatment, Industrial Emissions Directive 2010/75.EU (Integrated Pollution Prevention and Control) Pinasseau et. al. 2018*' for the following BAT references are met: BAT 2a, b, c, d, e, f and g, BAT 4a, b and c, BAT 5, and BAT 33.

4. TREATMENT

4.1 Treatment

- 4.1.1 The operation is designed to process up to 130,000 tonnes of waste per year through the onsite AD process, received as either packaged or unpackaged solid wastes, or pumpable liquid wastes, equating to approximately 356 tons per calendar day of fresh waste material.
- 4.1.2 The fermentation process will take place in a dual-step continuous flow anaerobic process that operates in the mesophilic range across three digesters (fermenters). The site configuration will be two primary digester tanks (fermenters) each with a working capacity of 3000 - 3100m³, and one secondary digester (post fermenters) with a working capacity of 7000 - 7500m³. A second post fermenter will be installed at the site under the site phase 2 development and will be designed and constructed to the same specification as the current tanks. The current digesters are three concrete tanks which were formerly at the site prior to the refurbishment. The two primary digesters are partly below ground and are fitted with leak detection systems with viewing chambers to allow for regular monitoring. The secondary digester is above ground on a concrete base. All three digesters are fitted with roof mounted double layer weatherproof and UV resistant gas storage bags above the tank space which are replacement infrastructure under the current refurbishment. The storage above the primary digesters will each provide a capacity for gas storage of 1950m³ and the storage above the secondary digester has a capacity of 3500m³. This gives a total biogas storage capacity of 5450 m³ which provides storage for approximately 3 hours of biogas production. When the additional post fermenter is installed, this capacity will be increased accordingly. An additional digestate store will also be installed as part of this phase 2 development. The digesters are fitted with a heating coil which will be utilised with hot water for heating of the process tanks. Each digester is fitted with submersible mixers for agitation of substrate. The digesters have been substantially refurbished as part of the recent site uplift. **A report outlining the works undertaken to uplift the digesters is presented as appendix 3.** The plant has been designed considering inspection, maintenance, and replacement schedules to ensure that a plant life of 20 years can be achieved.
- 4.1.3 Prior to digestion, all waste is macerated to at least 12mm particle size in a newly installed macerator which is a Vogelsang RotaCut RCX-58. This macerator includes a settlement chamber for removal of physical contaminants prior to maceration. The waste is then passed to one of two pasteurisation vessels where it is held for a minimum of 70 degrees Centigrade for a minimum of 60 minutes in accordance with APHA requirements.

Image 2: New 12mm Macerator Data Plate

- 4.1.4 The two new pasteurisation vessels are re-purposed tanks which are newly installed at the site as part of the recent refurbishment and replace the previously installed units. The vessels meet APHA requirements as reflected in the recent issue of a temporary APHA approval to accept ABP at the site.
- 4.1.5 Once the waste has been pasteurised, it is discharged from the pasteuriser to a buffer tank which is a 'feed reservoir' from which feed is regularly and fed into the digesters in a controlled consistent manner. The buffer tank is a re-purposed vessel which is newly installed at the site as part of the current refurbishment and replaces the former vessel/s used for the same purpose.
- 4.1.6 The anaerobic digestion process will begin in the primary digesters where most of the digestion of the substrate will be undertaken and as such most of the biogas will be produced. The digesters will be maintained at mesophilic temperatures (38-42°C) and stirred regularly to ensure stable digestion. From the primary digesters, the substrate is transferred to the secondary digester, which will also be operated at mesophilic temperatures. There is an average 20-day hydraulic retention time across the two digestion steps, dependent on final feedstock mixes. The secondary digester will further digest the organic material, ensuring that the substrate is fully degraded prior to removal from site for use as a biofertiliser. The two-step process allows for maximum possible utilisation of the substrate for biogas production.
- 4.1.7 Prior to the refurbishment, the operator was certified to the PAS110 standard as a producer of quality digestate and the operator intends to re-validate once operational again after the refurbishment to reinstate certified status. Part of the requirement for achieving this standard is the regular testing and analysis of digestate. One of the variables tested for is residual biogas potential, which gives re-assurance that the operator has achieved a high degree of utilisation of the substrate and produced a stable final product.
- 4.1.8 Substrate will be processed at a maximum rate of 356t per day of fresh waste feedstock material.

- 4.1.9 The combination of the heating and the mixing within the insulated tanks will ensure that the temperature and substrate are kept uniform throughout the digesters, avoiding sedimentation and development of floating layers. The outer walls of all digesters will be insulated and clad to achieve maintenance of the set point temperature.
- 4.1.10 Each digester is fitted with two under/over pressure relief valves that can vent gas to air in the event of a build-up of pressure in the tanks. The tanks are also fitted with foam sensors that will trigger an alarm to be sent to the operator if foam is detected. The tanks are fitted with a rapid dosing system for dosing with anti-foaming agent which will be triggered automatically if an alarm is received. Records will be kept regarding the use of pressure relief valves and use of the foaming dosing system and a full documented account made on occasions where these have operated. All digesters are fitted with sample points to enable controlled substrate removal for analysis.
- 4.1.11 The digesters are fitted with oxygen addition points and sulphur nets in the head of the digesters for biological control of hydrogen sulphide. The operator will also be able to dose ferric hydroxide introduced to the substrate at the point of the Tiger de-packager for chemical control of hydrogen sulphide.
- 4.1.12 Access to the tanks and associated plant, equipment and controls will be via a galvanised staircase with landings and gantry, allowing safe and unrestricted access for operational maintenance. Each digester is fitted with a viewing port with ATEX rated lights to allow the operator to view the inside of the tanks.

Image 3: Gas Storage Roofs and Gantry



- 4.1.13 Critical limits of the digestion process are as follows:

Table 2: Critical Limits of Digestion Process

Reactor	Parameter	Critical limits
Primary Digesters	Temperature	38 to 42 °C
	Minimum HRT	12 days
	Max Organic Loading Rate	5 kg VS/ m ³
Secondary Digester	Temperature	38 to 42 °C
	Minimum HRT	8 days
	Max Organic Loading Rate	5 kg VS/ m ³
	Substrate Feeding Rate	356 tons per day (fresh feedstocks)

- 4.1.14 The digesters are situated within an impermeable concrete bund that has been constructed to a suitable specification to contain any spillages arising from the site and sized to contain at least 110% of the largest vessel or 25% of the total tankage volume. The bund has been subject to significant additional investigation, corrective measures and uplift during the recent refurbishment to ensure that it meets the relevant standard (Ciria 736). A report setting out the **construction design and sizing calculations for the bund** is attached as **appendix 4**. Further details of the construction and properties of this bund are considered in this document in section 8.
- 4.1.15 The digestion tanks are fitted with temperature, pressure and level transmitters, which continually report data that is displayed on the computerised SCADA monitoring screens in the control room. Temperature/flow/feed rate can be controlled by this system. If high level thresholds set for temperature, pressure, or level are breached, a high-level alarm will sound. The control system has been uplifted as part of the recent refurbishment to provide the necessary level of control for the digestion tanks.
- 4.1.16 If high or low-level alarm conditions are reported to the central control system by in-vessel transmitters, the central control system will respond accordingly in order to return the process to normal operational range. An exceedance of the high-level threshold reported by the pressure transmitter will trigger an SMS alarm, and the initiation of the flare. In the event that the gas blowers are not operational, or the gas line is blocked, the automatic pressure relief valves will operate to vent gas to air. If a low-level pressure threshold is breached, this will trigger an SMS alarm, and the gas blowers will cease to operate. The pressure relief valves are operated based on the density of water, and hence these are managed by the addition of glycol (anti-freeze) to ensure that they are available to operate in colder weather conditions.
- 4.1.17 An exceedance of the high-level threshold reported by the level transmitter in the secondary digester will trigger an SMS alarm, and the feed from the primary digester to the secondary digester will stop. If the primary digester exceeds a high-level threshold for levels in these tanks, an SMS alarm will be triggered, and feed to the primary digester from the waste reception tanks will be

stopped. **An image of the SCADA system alarm and reporting controls** is included with this document as **appendix 12**.

- 4.1.18 The digesters each have temperature probes fitted at different levels within the tanks. The temperature transmitters in the digesters are set to trigger a response if the temperature should rise or fall from optimum level by a set amount. Fluctuations in temperature will be monitored, and the heating system will be automatically adjusted accordingly. Any breach of high or low-level thresholds will also trigger an SMS alarm.
- 4.1.19 Monitoring probes and equipment will be calibrated as required/recommended by the instrument supplier, and calibration records will be kept within the management system. All electrically operated monitoring equipment situated inside risk zones is ATEX rated.
- 4.1.20 Pipework and vessels have isolation valves fitted to enable maintenance activities or interventions.
- 4.1.21 The system is fitted with a series of non-return valves to ensure that material flows in a single direction and that the potential for uncontrolled backflow is avoided.
- 4.1.22 HRT and maximum organic loading rate are monitored via a flow meter and the retention can therefore be calculated and recorded on the central computer.
- 4.1.23 The critical limits specified in Table 1 are appraised every day on the Master Control Panel (computer) screen in the Control Room. The Master Control Panel is connected to the internet to allow remote connection to the system. Alarms can also be sent via SMS message.
- 4.1.24 The AD facility has a backup unit for keeping the PLC and other associated circuits live for 60 mins. This allows valves to be sent to a default position and for alarms on the system to be sent via email and SMS. Should the CHP stop producing power, the facility will automatically switch over to the imported power supply from the national grid. The site also benefits from a dual fuel biogas boiler that can provide heat to the process tanks using biogas or heating oil as a fuel.
- 4.1.25 Further parameters/operational conditions monitored by in situ monitors in the digesters are:
- Level of substrate monitored via level meters and triggers high- and low-level alarms; accordingly, and
 - Volume / capacity of digester tanks utilised (% capacity occupied).
- 4.1.26 The site operator will monitor the health of the digesters on at least a daily basis by analysis of samples on site. Samples will be taken on a daily basis from the primary and secondary digesters. There is a titration machine on site to enable the operator to monitor FOS/TAC ratio on a daily basis. The results of this analysis allow actions to be taken with regard to feedstock and process management to prevent abnormal condition from developing. The **Process Monitoring Plan** attached to this document as **appendix 5** outlines the process monitoring schedule for the plant, the indicative ranges of parameters monitored, and range of actions to be taken if variables monitored fall outside of the normal range required for healthy operation.

- 4.1.27 The site was previously equipped with an automatic (ground) 1000m³ back-up flare that was intended to burn gas in a controlled manner, at a minimum of 1,000°C and 0.3 seconds retention time at this temperature. The flare had the capacity to burn total biogas production in the event of CHP down time e.g., during periods of on-site/grid maintenance. Since the capacity of the site has been increased because of the site refurbishment, the pre-existing flare no longer provides sufficient capacity to manage all of the gas produced at the site should the need occur. A second BAT compliant 2000m³ flare has therefore been installed. The flares are mounted on concrete plinths with pedestrian access for inspection and maintenance, in a location that is compliant with DSEAR and ATEX regulations.

Image 4: Two BAT Complaint Flares



- 4.1.28 The **specification of the new additional flare** is included here as **appendix 6**.
- 4.1.29 Records will be kept of the flare use on the SCADA control system, and the reasons for its use will be documented within the EMS (Environmental Management System) incident documentation process if relevant.

- 4.1.30 All vessels and pipes are labelled and identified. All valves are labelled and have a unique identifier number that is cited on the master control screens, and repeated on connecting cables, airlines and valves.
- 4.1.31 All pipework is product labelled, and flow coded via stickers applied to the pipelines.

Image 5: Pipeline Labelling to Show Contents and Flow Direction



- 4.1.32 To achieve efficient biogas production, uniform homogenisation of the substrate is required. This is achieved by thorough mixing of the digester tanks to prevent stratification, floating layers and sedimentary layers in the fermenters. The tanks will contain ATEX rated electric mechanical mixers. Regard will be given to ease of access for maintenance work when positioning these within the tank.
- 4.1.33 The **maintenance schedule** for the digesters and mixers and associated plant has been updated to include all new equipment and plant installed at the site. All maintenance activity will be recorded on the computerised database system.
- 4.1.34 The pipework plan of the site will be updated and entered into the EMS following completion of works and the pipework functional configuration will be shown on updated P&ID's.

All plant and equipment will be subject to testing and sign off as part of the plant commissioning plan overseen by a suitably qualified commissioning engineer.

BAT Assessment Statement:

The infrastructure and processes and procedures that will be implemented to manage the treatment process will be compliant with BAT as outlined in to 'Biological waste treatment: appropriate measures for permitted facilities', 21 September 2022, GOV.UK

The required measures outlined in '*Best Available Techniques (BAT) Reference Document for Waste Treatment, Industrial Emissions Directive 2010/75.EU (Integrated Pollution Prevention and Control) Pinasseau et. al. 2018*' for the following BAT references are met: BAT 38.

5. BIOGAS TREATMENT AND STORAGE

5.1 Treatment

- 5.1.1 The digesters are fitted with gas collection and storage facilities in the roof space. These consist of a roof mounted gas tight collection membrane, protected by a second weatherproof and UV resistant protective layer. There is a total storage capacity of 5450 m³ which provides storage for 3 hours of gas production during steady state operations. The gas membrane rises and falls in response to fluctuating gas volumes stored in the roof. The storage capacity provided is sufficient provision to compensate for fluctuations in gas production, ensuring uniform operation of the gas utilisation equipment.
- 5.1.2 The biogas collection system associated with the digesters is fitted with pressure monitoring probes, and pressure relief valves, as described in section 4 of this document.
- 5.1.3 Qualitative data regarding the composition of biogas produced in the digesters is monitored by an in-line gas analyser. This measurement device serves as an analysis unit for biogas and has sensors for the following:
- Hydrogen sulphide H₂S;
 - CO₂
 - Oxygen O₂; and
 - Methane CH₄.
- 5.1.4 The gas analyser reports data to the SCADA control system and undertake a gas sample analyses on average every 2 hours. Data reported to the SCADA system is checked and logged by plant operatives daily. The gas analyser is calibrated per the manufacturer's specification.
- 5.1.5 Hydrogen sulphide is managed via a combination of biological control within the head of digesters, and dosing of ferric hydroxide to achieve precipitation if required. Nets are situated in the head of the digester to allow cultivation of sulphur removing bacteria. Small amounts of oxygen are injected into the head of the digesters to allow growth of aerobic bacteria that consume hydrogen sulphide and excrete elemental sulphur. The dosing system is controlled by the data reported from the gas analyser within the central control system. Ferric hydroxide is stored in bags on pallets in the waste reception building and can be added to the substrate at the de-packaging unit.
- 5.1.6 Biogas production rates are measured via a flow meter in the gas line. This device reports to the central control SCADA system, and a total volume produced can be calculated at an agreed rate at any given time when required.
- 5.1.7 All digestion tanks are equipped with gas pressure and gas level measurements and are interconnected via gas lines. Furthermore, each vessel is equipped with individual pressure relief valves which are designed to release the volume of gas passing through the tank if a critical under/over pressure point is reached. These valves are last safeguards to protect the tank gas storage. Under normal conditions the gas pressure sensors detect excess pressure and if excess biogas is present, triggers the gas flare. The new flare is a dual fuel type flare and is capable of burning biogas as well as biomethane rejected from the neighbouring BD Gas Permits Biogas Upgrading Facility in case of excess biogas production or instances where gas consumers are not

available. In case of a breakdown of all consumers on site (biogas upgrading unit, flare and boiler) the flares can be used to flare off the full production of Biogas and no gas will be released through the pressure relief-valves.

- 5.1.8 Biogas is sent to the adjacent BD Gas Permits Biogas Upgrading Facility via a dedicated pipeline. The gas must meet an agreed specification before it is accepted at the site. Any offspec gas or return gas due to plant downtime is sent back to the AD site gas storage bags or to flare if there is insufficient storage capacity.
- 5.1.9 During normal operation, the gas roofs are not full, but set to operate at 60-75% capacity and so there is suitable buffer storage available at most times to accommodate any off-spec gas returned from the upgrading system.
- 5.1.10 Condensate naturally forms in the main gas transport line from the AD plant and adjacent biogas upgrading unit. A dedicated collection system is in place to manage condensate arising in this way. The main collection sumps are fitted with a level pump switch and return condensate to the digesters via the condensate return line. The condensate sump is accessible for regular service checks via a surface manhole lid.
- 5.1.11 The site houses four CHP engine, two which were pre-existing at the site prior to the refurbishment, and two new units installed as part of the refurbishment. A table summarising the units at the site is given below.

Table 3 – Summary of CHP Units

CHP	New or Existing Unit	Outputs	Thermal Inputs
CHP 1 (Emission Point A1)	Existing Engine (Caterpillar)	2.026MW	4.93MWth
CHP 2 (Emission Point A2)	Existing Engine (Jenbacher)	0.499MW	1.24 MWth
CHP 3 (Emission Point A5)	New Engine (Caterpillar)	1.25MW	2.955MWth
CHP 4 (Emission Point A6)	New Engine (Caterpillar)	1.25MW	2.955MWth

- 5.1.12 The engines are used to supply heat and electricity to the process and for export. The **manufacturer's data sheet** for the new engines is attached as **appendix 7**.
- 5.1.13 The CHP units are housed in insulated containerised units. The CHPs are capable of processing biogas produced in the digesters. The Operator will ensure that the emissions from the CHP exhaust shall not exceed those quoted in the planning permission or the Environmental Permit for the site. Thermal energy from the CHP can be utilised to provide heat to the process tanks and any

pipe heating to meet the requirements of the process. The energy balances on site are further outlined in section 6 of this document.

- 5.1.14 The CHP containers are mounted on a foundation plinth with safe access provided around the circumference for operational and maintenance activities. The CHPs are fitted with a gas detection system within the CHP containers to activate both an audible and visual alarm both internally and externally to prevent access to the container should gas levels be hazardous. The alarm will initiate shutdown of the gas supply to the CHP.
- 5.1.15 Particulates present in the biogas that may cause mechanical wear in the CHP engine are removed via a mesh filter in the engine compartment of the CHP unit. Air filters on the air intakes to the CHPs will prevent ingress of dust, airborne particles, and moisture.
- 5.1.16 The site will also be fitted with a dual fuel biogas boiler that will burn biogas to provide heat for process tanks as a backup contingency measure. The boiler will also be capable of operating on diesel fuel if required in emergency or atypical operational conditions. A **data sheet for the boiler** is included with this document as **appendix 8**.
- 5.1.17 All other biogas not utilised in the boiler or CHP for plant operation purposes will be upgraded and injected into the national gas grid network via the adjacent BD Gas Permits Upgrading Facility which is a new directly associated activity to the Bio Dynamic UK Limited AD operation.

BAT Assessment Statement:

The infrastructure and processes and procedures that will be implemented to manage biogas treatment and storage will be compliant with to 'Biological waste treatment: appropriate measures for permitted facilities', 21 September 2022, GOV.UK

The required measures outlined in '*Best Available Techniques (BAT) Reference Document for Waste Treatment, Industrial Emissions Directive 2010/75.EU (Integrated Pollution Prevention and Control) Pinasseau et. al. 2018*' for the following BAT references are met: BAT 4a – c.

6. ENERGY RECOVERY

6.1 Energy Recovery Details

- 6.1.1 The operator has a number of measures in place to maximise energy recovery and use on site. There will be a CHP engine on site that will meet the energy needs of the site. Heat from the engine cooling waters will be recovered for use in heating of tanks on site via use of a heat exchange system.
- 6.1.2 There is also a dual fuel biogas boiler that will utilise biogas to provide heat to supply for process tanks as a contingency measure should there be CHP downtime. This boiler will also be available for use during start-up of the site.
- 6.1.3 An outline of the operator's intentions to comply with BAT in this area is included in the permit variation application for the site, reference **HC1677-20 Energy Balances and Resource Efficiency**. This document outlines the operator's intentions to carry out ongoing monitoring of energy use on site, and to carry out a review of potential savings that can be made, both in process areas and from domestic facilities on site.
- 6.1.4 To provide a baseline from which monitoring and review can take place, the operator has prepared a provisional outline of mass balances within the plant operations which shows the change in balances before and after this variation. This is included with the current permit variation application as document **HC1677-20 Energy Balances and Resource Efficiency**.

BAT Assessment Statement:

The infrastructure and processes and procedures that will be implemented to manage energy recovery will be compliant with BAT as outlined in to 'Biological waste treatment: appropriate measures for permitted facilities', 21 September 2022, GOV.UK

The required measures outlined in '*Best Available Techniques (BAT) Reference Document for Waste Treatment, Industrial Emissions Directive 2010/75.EU (Integrated Pollution Prevention and Control) Pinasseau et. al. 2018*' for the following BAT references are met: BAT11 and BAT 23.

7. DIGESTATE TREATMENT AND STORAGE

7.1 Digestate Treatment and Storage

- 7.1.1 Digestate will be removed from the secondary digester by tanker to spread to land as an agricultural fertiliser. Offsite storage facilities are available for storage of digestate at the site or spreading.
- 7.1.2 The operator has previously been certified as a producer of PAS110 certified quality digestate. As the site has undergone a major refurbishment, the operator has temporarily suspended the certificate and will go through a re-validation process once the site is able to process material again.
- 7.1.3 The operator will then be able to re-activate the certificate and digestate will be dispatched from site as end of waste material.
- 7.1.4 As part of the phase 2 site refurbishment activities, the operator will install an additional post digester and digestate store. These two additional tanks have yet to be specified and installed but will be gas tight concrete tanks located in the main site bund area.
- 7.1.5 Digestate offtake from the secondary digester will take place from a dedicated tanker offtake station. The area has impermeable concrete surfacing and a dedicated impermeable concrete drainage sump that has the capacity to contain spills from a whole tanker should the need occur in exceptional circumstances.
- 7.1.6 Digestate will be taken off site for spreading and storage by a third-party landspreading contractor. This contractor will hold a mobile plant permit for spreading of wastes to land for agricultural benefit, and so will be able to manage digestate arising from the plant prior to its certification as PAS110 ADQP compliant material.
- 7.1.7 The operator will ensure that all digestate produced that is a waste will be spread to land by a landspreading operator who is the holder of a mobile plant landspreading permit. The operator will ensure that all waste is stored and spread to land according to a waste deployment issued by the Environment Agency.
- 7.1.8 Once end of waste status has been achieved, the operator will have a contingency deployment and/or offsite waste storage facility in place at all times to allow off site storage and spreading in the instance that any batches of digestate fail to meet the PAS110 criteria standards.
- 7.1.9 If the nature of the failure of the batch of off spec material is such that the digestate is not suitable to be spread to land as a waste, then the material will be removed off site and disposed of at a suitable disposal facility.

BAT Assessment Statement:

The infrastructure and processes and procedures that will be implemented to store digestate will be compliant with BAT as outlined in to 'Biological waste treatment: appropriate measures for permitted facilities', 21 September 2022, GOV.UK

The required measures outlined in '*Best Available Techniques (BAT) Reference Document for Waste Treatment, Industrial Emissions Directive 2010/75.EU (Integrated Pollution Prevention and Control) Pinasseau et. al. 2018*' for the following BAT references are met: BAT 4a-c and BAT 5.

8. EMISSIONS CONTROL AND ABATEMENT

8.1 Fugitive Emissions

- 8.1.1 The point source emissions to air and water and associated monitoring points from the plant are outlined in application documents HC1677-06a and Site Boundary, Layout and Emissions Points Plan, and HC1677-10 Point Source Emissions.
- 8.1.2 The potential for air quality impacts from emissions from the CHP engines, the flares, and dual fuel boiler have been assessed via dispersion modelling and a report of the findings supplied in an appendix to the application document as HC1677-08 Environmental Risk Assessment. This report concludes that the predicted short term and long-term PECs at the sensitive human and ecological receptors are 'not significant'.
- 8.1.3 The gas consumers at the site will be subject to regular maintenance, monitoring and re-tuning to ensure optimum performance. The programme of monitoring and maintenance to be undertaken will be defined in association with the technology providers who will provide service and maintenance support once the site becomes operational. Where relevant this will also be carried out in line with guidance LFTGN08 Guidance for Monitoring Landfill Gas Engine Emissions.
- 8.1.4 All maintenance and monitoring activities related to gas consumers will be documented.
- 8.1.5 All use of the flares and PRV's will be recorded and accounted for. The PRV's will be checked and maintained regularly as outlined in the site's maintenance programme. The flares will be subject to regular maintenance and monitoring checks, to be defined in association with the service provider for the flares.
- 8.1.6 An annual monitoring exercise will be carried out for emissions from the CHPs and boiler (if required). This will be reported to the Environment Agency as required. The sample points will be identified in line with the M1 guidance. This monitoring and sample point selection will be done in association an MCERTS accredited external contractor who will be commissioned to undertake the exercise. Annual monitoring of the flares will be undertaken if it is used for more than 10% of operational time. Factors to be considered when selecting the sample point for engine monitoring are outlined in document HC1677-12.
- 8.1.7 The odour impacts of point source emissions to air have been assessed via dispersion modelling and a report of the findings supplied in an appendix to application document in HC1677-08 Environmental Risk Assessment. This assessment has concluded that predicted odour concentrations were below the relevant EA odour benchmark level at all residential receptor locations. As such, potential odour emissions from the facility are not considered to be significant. The measures to be implemented across the site to manage odour to prevent negative impacts beyond the site boundary are outlined in the site's odour management plan which has been produced in accordance with the Environment Agency's H4 Odour Management Horizontal

Guidance, and document 'drafting an odour management for AD facilities – an informal guide'. This plan is included with this application as document reference HC1677-18.

- 8.1.8 Technical descriptions and specifications of the odour abatement system are outlined in the odour impact modelling assessment report submitted with this application as document HC1677-08 Appendix 6. The odour abatement system at the site has been reviewed and updated as part of the plant refurbishment and a new BAT compliant system installed. A new abatement system is proposed for the waste reception shed and additional abatement measures have been installed to manage odours arising from the digestate tanker offtake point and from displaced air from liquid waste reception tanks. The full manufacturer's specification of this equipment will be provided in due course once available.
- 8.1.9 Emissions monitoring of the odour abatement emissions will be carried out according to the requirements in the permit.
- 8.1.10 Surface water arising from the roof of the waste reception shed and from concrete bunded areas will be collected in a sump and pumped to a surface water storage tank located in the main reception building. This water will then be used in the process.
- 8.1.11 Domestic sewage will be collected in a sealed sump/cesspool integral to the staff offices/welfare building and removed from site by tanker for disposal/treatment.
- 8.1.12 There is an internal sealed drainage system in the waste reception shed. Leachate and wash waters arising in the shed drain to two internal sealed sumps and is then pumped from here back into the AD process.
- 8.1.13 Site plans have been submitted with this application which show the surfacing at the site as a whole, and the internal sealed drainage system in the waste reception shed and the internal drainage system/spill collection system in the tanker offtake/waste reception area. References for these plans are HC1677-06b and HC1677-06e.

8.2 Fugitive Emissions

- 8.2.1 There are potential sources for fugitive emissions from the site. These have been considered in the design specification for the plant, and infrastructure and operation designed to minimise these impacts where possible.
- 8.2.2 In addition to this, the operator has a **fugitive emissions plan** for the site, incorporating a 'source-pathway-receptor' assessment of the potential for releases from the site, and outlining the infrastructure, maintenance and monitoring measures to be implemented to control these potential releases during site operations. This document has considered all the potential sources listed on page 112 of the How to Comply document for Anaerobic Digestion. This document is included with this application as **HC1677-17**.

- 8.2.3 The fugitive emissions plan includes reference to a leak detection and repair (LDAR) programme that outlines the operators schedule of checks for gas leaks arising at the site in accordance with the permit requirements.
- 8.2.4 The operator has outlined the measures that are in place to control and monitor odours from the site (during normal operations, and during emergency events) within acceptable limits in the updated **odour management plan**, document reference **HC1677-18**.
- 8.2.5 The operator has outlined the measures that are in place to control accidental releases and spillages in the updated **accident management plan**, document reference **HC1677-22**.
- 8.2.6 The operator has undertaken lightning risk assessment for the site, and the site is fitted with lightning earthing rods, one fitted on the north end reception hall and a second on a buffer tank at the south end of the site.
- 8.2.7 The site has been designed according to a **Hazard and Operability Study (HAZOP)**, and subject to a full **Dangerous Substances and Explosive Atmospheres (DSEAR)** assessment which have been updated based on the site changes. Current iterations of these are included here as **appendices 9 and 10**. A fire risk assessment has been undertaken and will be reviewed on a regular scheduled basis. The operator has hosted a visit at the site with the local fire and rescue service. The nearest fire hydrant is located 300m away and the fire and rescue service indicate that the river Trent could be used as a source of water in an emergency. The fire service has also noted that a bowser will be brought to the site in the event of an incident. Measures for managing risk arising from management of gas at the site are outlined in the fugitive emissions plan and accident management plan for the site. The site EMS includes an accident management plan that takes into account the potential for fires at the site and includes preventative aspects to manage ongoing health and safety aspects such as permits to work system including hot works permits, use of personal and fixed onsite gas monitors, SCADA control system with a schedule of automatic shut off alarms, and a staff training schedule tailored to operations.
- 8.2.8 The currently published EA guidance 'Fire Prevention Plans: Environmental Permits states in section 3 that the guidance does not apply to biowaste treatment wet anaerobic digestion facilities. The operator considers that the objectives listed in section 1 of the EA guidance have been met through the establishment and implementation of the measures described here and as such a fire prevention plan is not considered to be needed in addition to these aspects at this time.
- 8.2.9 Risk of nuisance from noise arising from the site has been assessed via an impact modelling assessment and the results of this modelling presented with this application as HC1677-08 appendix 2. The assessment has concluded that the rating level L_{Ar,Tr} is below the existing background sound level during the most sensitive night-time period at all receptors. This indicates a low likelihood of adverse impact.
- 8.2.10 The operator will outline the measures to manage noise arising from day-to-day site operations in the **noise management plan** document reference **HC1677-19**.

- 8.2.11 The outdoor liquid feedstock pre-storage tanks and main treatment/processing and storage infrastructure at the site are contained within an impermeable bund. The bunding has been sized in order to accommodate a volume of at least 110% of the largest vessel or 25% of the total tankage volume.
- 8.2.12 The operator has installed new bunding arrangements at the site to provide secondary containment to the new refurbished outdoor tankage. The existing bund has been substantially refurbished. All new bunding and refurbishment/corrective works have been designed and implemented in accordance with the standard specified by the Environment Agency (EA), CIRIA C736 - Containment Systems for the Prevention of Pollution by suitably qualified persons. During the process of construction, and on completion of construction, the works will be reviewed by a suitably qualified person to verify that works have been carried out according to their design.
- 8.2.13 The **bund design report and capacity details** are attached to this document as **appendix 4**.
- 8.2.14 The facility containment bund has been designed to be impermeable. It is formed of a series of retaining walls and impermeable concrete base (slab) that enclose the key operations at the facility and provide containment for the above ground tanks containing liquids. An impermeable liner underlies the concrete surfacing.
- 8.2.15 The containment system is designed to meet the requirements of BAT as set out below in the BAT assessment Statement.

BAT Assessment Statement:

The infrastructure and processes and procedures that will be implemented to control fugitive emissions will be compliant with BAT as outlined in the to 'Biological waste treatment: appropriate measures for permitted facilities', 21 September 2022, GOV.UK

The required measures outlined in '*Best Available Techniques (BAT) Reference Document for Waste Treatment, Industrial Emissions Directive 2010/75.EU (Integrated Pollution Prevention and Control) Pinasseau et. al. 2018*' for the following BAT references are met: BAT 7, BAT 8, BAT 10, BAT 12, BAT 13a and b, BAT 14, BAT 15, BAT 16, BAT 17, BAT 19, BAT21b, BAT 35.

9. MANAGEMENT

9.1 Facility Management

- 9.1.1 Bio Dynamic UK Limited have engaged a specialist principal contractor, Anaergia Limited, to oversee operations at the site. Bio Dynamic UK Limited have developed an Environmental Management System that is implemented and updated by the contractor (Anaergia). The formal controlled environmental management system is designed to ensure the following:
- that environmental risk and impacts are managed proactively;
 - that all legislative requirements are complied with; and
 - that procedures are in place to enable timely and effective response to environmental incidents should they occur.
- 9.1.2 The operator has taken note of the Environment Agency AD site assessment spreadsheet tool when developing the management system for the site to ensure compliance with the parameters included.
- 9.1.3 The operator will ensure that either the site is attended for the required number of hours by a holder of a suitable WAMITAB award (MROC5), and cover arrangements will also be established to ensure that the necessary attendance takes place even during staff holiday and sick periods.
- 9.1.4 The site staff team includes a full-time site manager, 2-4 full time site operatives, and further technical support from the wider Anaergia business. The site team will also be supported by service staff for specific items of infrastructure according to contractual agreement (e.g., Uniflare for flare maintenance) and will have access to support from the Operations Manager, Senior Directors, and in-house Biologist who operates as part of the wider Anaergia specialist AD provider portfolio.
- 9.1.5 All samples sent to third party facilities for analysis are sent to a suitably registered or accredited lab. This is NRM laboratories.
- 9.1.6 A list of current controlled documents included in the management system for the plant is provided with this application as HC1677-05 Summary of EMS.
- 9.1.7 The operator has previously achieved PAS110:2014 certified status and intends to continue to implement the quality management system required for this certification.
- 9.1.8 The operator has conducted an air quality impact assessment, noise impact assessment and odour impact assessment based on the site operations. The operator has updated the qualitative risk assessment based on the 'source, pathway, receptor' model and taking into account the changes at the site following the refurbishment. These assessments have been provided with this application as HC1677-08 Environmental Risk Assessment. Based on the outcome of these assessments, the operator has developed and updated a number of management plans that detail measures for managing identified risks following implementation of changes at the site. These include an **odour management plan, noise management plan, fugitive emissions**

management plan, and accident management plan. These plans outline the measures that will be taken to mitigate against potential impacts and include monitoring and maintenance procedures and specific staff training requirements. These documents have been provided with this permit application as HC1677-17 Fugitive Emissions Plan, HC1677-18 Odour Management Plan, HC1677-19 Noise Management Plan and HC1677-22 Accident Management Plan.

- 9.1.9 The environmental management system also includes procedures for reporting, documenting and investigating incidents, near misses, complaints, and non-compliances.
- 9.1.10 The pest management measures at the site have been updated and approved by the APHA at issue of the temporary approval for the site to process ABP.
- 9.1.11 The management system includes procedures for regular maintenance checks/activities on plant machinery and infrastructure to control identified high risk activities, and external and internal audit systems. The site also carries a supply of critical spares to enable timely response to breakdown and the need for repair. This has been reviewed and updated in accordance with the site changes.
- 9.1.12 All staff employed at the site have defined job descriptions, that define the skills and competencies required to carry out the required role. These clearly defined roles will be the basis for a staff training needs assessment, which will form the basis of the staff training plan for the site.
- 9.1.13 All staff receive training that enables them to understand the regulatory context in which the plant is operating, and the impact that their own particular role may have on compliance with the permit. All staff are trained to develop an awareness of the potential environmental impacts of the operations on site, and in the reporting procedures for incident and near misses.
- 9.1.14 All staff receive training in the implementation of the site's accident management plan **HC1677-22 Accident Management Plan.**
- 9.1.15 The training needs/information sharing requirement of contractors visiting the site are considered within the training needs analysis for the site, and systems set up accordingly to ensure that contractors are equipped with sufficient training and knowledge to undertake their activities on site in a manner that is in line with the operator's systems for management of environmental risk at the site.
- 9.1.16 The operator has updated the raw materials inventory detailing tonnage of raw materials used on an annual basis following the site refurbishment. The nature and volumes of materials used on site will be reviewed on an ongoing basis and where possible efficiencies will be made, or changes will be made in the selection of materials used to ensure that low impact options are used wherever possible. This will be included in the management system and is provided to support this permit application reference **HC1677-16 List of Raw Materials.**
- 9.1.17 Similarly monitoring and review of wastes produced, water usage, and energy usage is carried out in order to identify areas where efficiencies can be made. As part of the site refurbishment the operator has made provision for collection and use of rainwater from the roofs of buildings and from concrete process areas.

- 9.1.18 The operator has prepared an inventory of wastewater and waste gas streams produced at the site to allow suitable assessment and management of these on an ongoing basis (see HC1677-21).
- 9.1.19 The operator intends to recover all digestate arising from the AD plant for use as a fertilizer on arable land at farms in the surrounding area.
- 9.1.20 The operator has previously prepared a Site Condition Report that is retained in the EMS and that documents the characteristics of the site prior to development, as a baseline from which to measure the impact of operations over time. Update will be made to the report to reflect the site layout and infrastructure changes at the site. Changes/relevant events/incidents impacting on the characteristics of the site will continue to be recorded in this report on an ongoing basis throughout the life of the plant. It will be possible to use this report as the basis of any detailed plan, or requirement for specific measures that may be needed to return the site to a fit state at the point of decommissioning.
- 9.1.21 The operator has updated the site Closure and Programme in view of the site refurbishment, outlining the measures that will be carried out in the event of site closure to ensure that the site is left in a state that addresses any subsequent risk to the environment arising from this process.
- 9.1.22 The operator has updated the Dangerous Substances and Explosive Atmospheres (**DSEAR**) assessment of the site in order to inform suitable infrastructure and management of operational activities at the site. A Hazard and Operability Study (**HAZOP**) has also been undertaken to inform the design and commissioning process at the site. These documents are now included as **appendices 9 and 10**. The **atex (explosive atmospheres) zones plans** for the site are presented as **appendix 11**.

BAT Assessment Statement:

The management system that will be established to ensure that all measures required to manage risk on site are implemented effectively will be compliant with BAT as outlined in to 'Biological waste treatment: appropriate measures for permitted facilities', 21 September 2022, GOV.UK

The required measures outlined in '*Best Available Techniques (BAT) Reference Document for Waste Treatment, Industrial Emissions Directive 2010/75.EU (Integrated Pollution Prevention and Control) Pinasseau et. al. 2018*' for the following BAT references are met: BAT 1, BAT3, BAT 12, BAT 17, BAT 18, BAT 21, and BAT 22.

10. MONITORING

10.1 Monitoring Details

- 10.1.1 The operator has outlined the sampling and monitoring regime for the process in the **Biogas Process Monitoring Plan** included with this document as **appendix 5**. This document summarises the measures in place to ensure robust process monitoring for the digestion process.

10.1.2 In addition to this, the management system outlines the schedule of monitoring relating to the following areas:

- Annual monitoring of CHP engine and biogas boiler exhaust emissions (by MCERTS Certified Consultancy);
- 6 monthly performance monitoring for odour abatement equipment according to the standard specified in the site permit;
- Monitoring/recording of Flare use (on SCADA system);
- Monitoring of critical control points in the HACCP;
- Sample analysis monitoring for PAS110 compliance;
- Ongoing monitoring of feedstock quality/compliance with agreements/incoming feedstocks procedure;
- Monitoring/recording of use of pressure vents on digesters;
- Monitoring of energy and raw material usage;
- Pollution Emissions Inventory Reporting;
- Annual performance monitoring and reporting to the Environment Agency;
- Quarterly waste returns reporting to the Environment Agency;
- Ongoing process monitoring as specified in the site EMS and permit;
- Ongoing monitoring of the effectiveness of odour abatement equipment installed on site Odour Management Plan submitted as HC1677-04 and as specified in the site permit;
- Daily odour impact monitoring at receptors (Odour Management Plan submitted as HC1677-18);
- Other on-site regular environmental monitoring identified by the environmental risk assessment, and specific management plans including the odour management plan, fugitive emissions plan, noise management plan, and accident management plan (these documents have been submitted with this permit application as documents HC1677-17, HC1677-18, HC1677-19, and HC1677-22);
- Monitoring of maintenance issues/infrastructure such as bund surfacing, drainage channels, sumps and collection systems etc;
- Ongoing monitoring of ambient gases levels via visual checks, use of gas monitors and in accordance with 6 monthly LDAR;

- Ongoing monitoring and review of complaints and incidents occurring on site (Noise Complaint Form, Odour Complaint Form, Incidents and Complaints Summary and Preventative and Corrective Measures Tracking);
- Ongoing monitoring of the impact of operations on the site, via establishment of baselines in the site condition report, and collection of data regarding impact of site operations for the life of the site; and
- All other monitoring outlined in the various site management plans; odour management plan, fugitive emissions plan, noise management plan, and accident management plan (these documents have been submitted with this permit application as documents HC1677-17, HC1677-18, HC1677-19, and HC1677-22).

10.1.3 A full list of management system documents is provided with this application as **HC1677-05 Summary of EMS.**

BAT Assessment Statement:

The infrastructure and processes and procedures that will be implemented to monitor operations for a range of different purposes will be compliant with BAT as outlined in to 'Biological waste treatment: appropriate measures for permitted facilities', 21 September 2022, GOV.UK

The required measures outlined in '*Best Available Techniques (BAT) Reference Document for Waste Treatment, Industrial Emissions Directive 2010/75.EU (Integrated Pollution Prevention and Control) Pinasseau et. al. 2018*' for the following BAT references are met: BAT 3, BAT 8, BAT 10, BAT 11.

11. IMPACT

11.1 Impact Assessment

11.1.1 The operator has carried out an assessment of the potential receptors to the site, and a qualitative 'source – pathway – receptor' risk assessment of the potential impacts at these receptors (HC1677-08).

11.1.2 Potential impacts on nearby receptors have been assessed via impact modelling assessments as follows;

- The operator has commissioned an air quality impact assessment based on predicted impacts from the burning of biogas in the CHP engines, dual fuel boiler, and flare. This report concludes that the predicted short-term and long-term PECs at the sensitive human and ecological receptors are 'not significant'. The site is therefore unlikely to be a significant contributor to or cause an exceedance of an EAL (or upper critical load / level). This report is included with the Bio Dynamic UK Limited permit variation application permit as **HC1677-08 appendix 1**.
- The operator has commissioned a noise impact assessment, and this is provided with the Bio Dynamic UK Limited permit variation application as HC1677-08 appendix 2. The report concludes that the rating level L_{A,r,Tr} is below the existing background sound level during the most sensitive night-time period at all receptors. This indicates a low likelihood of adverse impact.
- The operator has commissioned an odour impact assessment. This report has been included with the Bio Dynamic UK Limited permit variation application as **HC1677-08 appendix 7**. This report concluded that predicted odour concentrations were below the relevant EA odour benchmark level at all residential receptor locations. As such, potential odour emissions from the facility are not considered to be significant.
- A desk top bioaerosols risk assessment has been undertaken for the site. This has been included with the Bio Dynamic UK Limited permit variation application as **HC1677-08 appendix 3**.

BAT Assessment Statement:

All impact assessment modelling conducted has demonstrated that potential impacts can be managed within acceptable levels within the current proposals.



Registered office:
Staffordshire House
Beechdale Road
Nottingham NG8 3FH
Company No. 7861810

☎ 0115 923 2253
☎ 07506 658098 / 07525 211381
🌐 www.hc-consultancy.co.uk