MURROW AD PLANT LIMITED
PERMIT VARIATION APPLICATION
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REPORT SCHEDULE

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Appendices

1. INTRODUCTION

1.1. Introduction

1.1.1. The Murrow AD Plant Ltd is a wet mesophyllic anaerobic digestion (AD) facility located at Somerset Farm Cants Drove, Murrow, Wisbech, Cambs, PE13 4HN, approx. central grid reference TF 37303 04635. Murrow AD Plant Ltd has entered into an operations and maintenance contract with Adapt Biogas Ltd who oversee operations and maintenance at the site working on behalf of Murrow AD Plant Ltd.

1.1.2. The site is currently permitted to operate according to standard rules permit SR2021 No.8; on farm anaerobic digestion facility using farm waste only, including use of the resultant biogas; Part A installation – treatment capacity over 100 tonnes of waste per day Environmental Permit No. EPR/FB3133AW/V005. Following the now requested variation to the permit, the operator will operate according to a bespoke installation permit with the capacity to process up to 125,000tonnes of feedstocks a year of feedstocks in the AD process. The average hydraulic retention time for feedstocks processed at the site is 35 days.

1.1.3. In addition to the main Schedule 1 anaerobic digestion (AD) activity at the site, there are several other directly associated activities (DAA's) undertaken as follows; emergency flare operations, biogas combustion in CHP engines, biogas upgrading to biomethane, raw material storage, biogas treatment (desulphurisation), digestate separation, digestate storage, incoming waste storage, incoming waste treatment, recovery of CO_2 to produce a food grade product, and storage of the final recovered liquid CO_2 product.

1.1.4. The operator treats purpose grown crops, (principally maize), crop residues, liquid residues, and animal manures and slurries within five primary and one secondary anaerobic digestion tank to produce biogas and digestate.

1.1.5. 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 the Environment Agency (EA) Technical Guidance Note 'How to comply with your Environmental Permit. Additional Guidance for: Anaerobic Digestions' (LIT 8737, v1.0 Nov 2013), 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, and EA Technical Guidance 'Biological Waste Treatment: Appropriate Measures for Permitted Facilities (Sept 2022). This report provides an assessment and demonstration of how these standards have been applied/will be applied at the Murrow AD Plant site.

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 Somerset Farm Cants Drove, Murrow, Wisbech, Cambs, PE13 4HN, approx. central grid reference TF 37303 04635.

2.1.2. The site is located on the site of the wider Somerset Farms farming operations which in addition to the AD operations incorporates other livestock production and arable and grass farming activities. The surrounding area is agricultural in nature. The residential receptors and habitats sites receptors in the vicinity of the site are detailed further in the environmental risk assessment for the site submitted with this application reference CB2107-08.

2.1.3. The western corner of the site is situated upon an unproductive secondary aquifer and a principal bedrock aquifer (medium-low vulnerability), and the location of the remainder of the site is described as unproductive aquifer. The site is situated in A Flood Zone 3 and shown on the 'Groundsure report' GS-9090856 (submitted with site condition report CB2107-06) to be at medium risk for flooding.

2.1.4. A series of field drainage channels run near to the AD site from just over 10 metres from the permitted site boundary. The River Nene is 2.5 km to the south and east of the site, and the Nene washes SSSI, SPA and RAMSAR Site is located approximately 2.2km to the south of the site.

2.1.5. Further details of receptors can be found in the Environmental Risk Assessment associated with the Murrow AD Plant permit application at document CB2107-08.

2.1.6. The site and its setting are shown below in Figure 1, and the site layout in Figure 2. Both of these plans are submitted as stand-alone application supporting documents, reference CB2107-05b Murrow AD Plant Site Location Plan, and CB2107-05a Permit Boundary and Emissions Plan.

Figure 1 The Site and It's Setting (CB2107-05b)

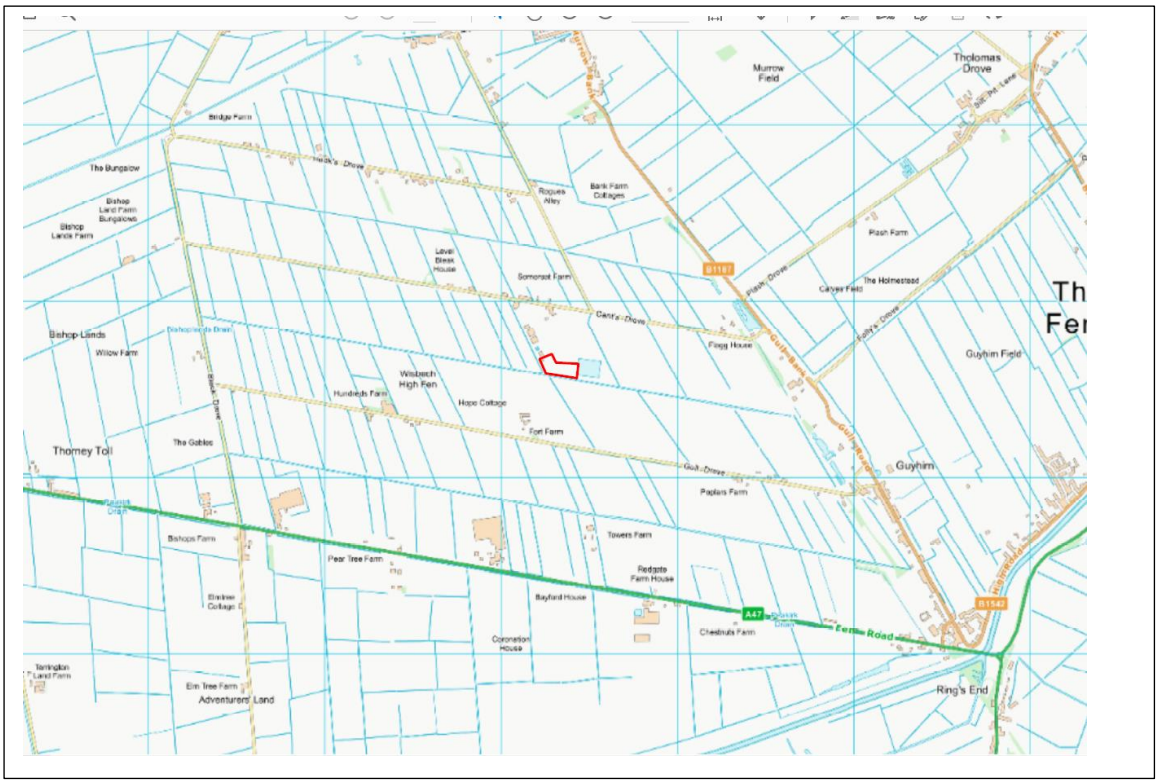
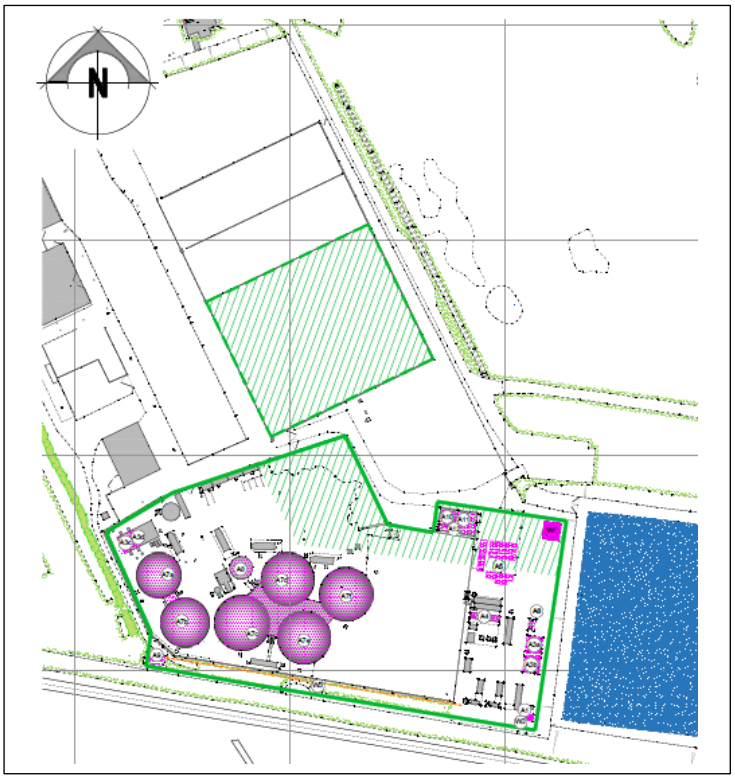


Figure 2 Site Layout (CB2107-05a)



3. FEEDSTOCK ACCEPTANCE PROCEDURES

3.1. Feedstock Pre-Acceptance

3.1.1. The operation is designed to process up to 125,000 tonnes of feedstocks per year received as either liquid bulk tanker loads, or solid bulk trailer loads. Feedstocks are all of a farming, crop based, and plant-based nature and consist of purpose grown non-waste energy crops, animal manures and slurries, and liquid and solid crop residues from processing of crops. The feedstocks will be provided according to a supply agreement and subject to pre-acceptance assessment for suitability.

3.1.2. The operator does not intend to make any additions to the list of wastes that appear on the site permit under this current variation and the list of wastes as shown on the current permit will remain unchanged.

3.1.3. A large majority of feedstocks are generated or produced at the wider Somerset farm. Somerset farm produces cattle, and farmyard manure from cattle sheds immediately adjacent to the AD plant is moved internally within the farm for use at the AD plant. Energy crops are ensiled in a clamp immediately adjacent to the AD process bund. This clamp area is now included in the Murrow AD Plant permitted area. The operator proposes to install a cover on the liquid reception tank in accordance wit BAT.

3.1.4. An estimate of feedstock type breakdown/proportions to be processed at the site is given in Table 1.

Table 1 – Estimated Breakdown of Feedstock Types

Feedstock Type	Source(s) of Feedstock	Form of Feedstock	Storage Location	Estimated Annual Tonnages Received
Cattle FYM	Grown on farm/ under contract at other farms or imported from local sources	Solid	Somerset Farm	30,000
Animal Slurries, Wash Waters and Liquid Residues	Produced by Somerset Farm livestock	Liquid	Liquid reception tank and onsite drainage system	22,000
Poultry Manure	Somerset Farm and imported from external animal feed producers or farm premises.	Solid	Received on a ‘just in time’ basis and loaded directly from trailers into feed hopper	4,680
Crop Residues (non-waste derived from fruit/veg, and	Produced on-site or	Solid	Somerset farm and just in	42,320

Feedstock Type	Source(s) of Feedstock	Form of Feedstock	Storage Location	Estimated Annual Tonnages Received
other plant-based materials from agricultural premises)	imported from other farm processing sites		time storage area at the AD site	
Maize/Energy Crops	Third party farms	Solid	Somerset Farm	26,000
				125,000

3.1.5. 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.

3.1.6. The feedstock supply agreements 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, stones, sand, plastics, inhibiting substances etc.), required standards for transportation methods of feedstocks, and provision of suitable documentation and labelling to accompany the load. The parameters for feedstock acceptance are outlined in **the Feedstock Acceptance Criteria** for the site that is attached to this document as **Appendix 1**.

3.1.7. Feedstock supplier agreements will be subject to review at least 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 six years and updated on at least an annual basis.

3.2. Feedstock Acceptance Procedures

3.2.1. All new suppliers of feedstocks are assessed pre-acceptance. This process of assessment is outlined in the Feedstock/Waste Acceptance Criteria and is recorded on the **New Supplier Assessment Form**, included with this document as **Appendix 2**.

3.2.2. Feedstocks are delivered to site via bulk trailers or tankers and delivered to the liquid feedstock/leachate reception tank or in the case of solid feedstocks, to the concrete bay storage areas.

3.2.3. Feedstocks will be received at the site in line with the **Feedstock Acceptance and Rejection Procedure** included with this document as **Appendix 3**.

3.2.4. Solid feedstocks are tipped into the concrete reception and storage area immediately adjacent to the main AD process tanks which is 15 m x 30 m (1,500 m3 capacity). Additional capacity for feedstock storage is available in the clamp area adjacent to the main AD site which is now brought into the permitted area. Energy crops are also ensiled in this area for use in the AD plant process. **Construction**

drawings for this additional clamp area and associated drainage collection tank are included with this document as Appendices 10 and 11. The clamp is comprised of concrete slab flooring and concrete walls along the sides and back of the pads. Around the exterior of the clamp is a perimeter drain in accordance with SSAFO requirements. The drainage from the clamp terminates in a sealed collection tank to the east of the clamp. A level float switch in this tank triggers liquid to be pumped automatically to the AD facility for processing. There is a bypass separator online on the clamp drainage system prior to the collection pit for management of run off of oil from vehicles and machinery. The **specification of the interceptor is included with this document as Appendix 12**. Materials will be managed on a rotational 'first in first out' basis to ensure stock control and conformance to maximum storage times of 2-3 days. Should poultry manure be sourced and received at the site, this will be received on a 'just in time' basis as sheeted loads and loaded straight from the delivery vehicle into the feeder units for immediate use. It is anticipated that up to one load a day of poultry manures will be received at the site.

3.2.5. Tankers carrying liquid feedstocks enter the site via the main site weighbridge and couple up to the liquid feedstock reception/leachate tank to deliver the load. A sample of all loads is inspected for contaminants and odours via sniff and sieve tests. Loads can be rejected if contamination or odours are deemed to be excessive.

3.2.6. The liquid feedstock/leachate reception tank is a 300m^3 capacity covered metal tank with internal mixers. Liquid leachate from the internal drainage system at the site can be pumped directly to this tank.

3.2.7. All liquid feedstock deliveries received on site are supervised by a member of site staff and carried out on an impermeable concrete surface inside the main concrete site process bund. Deliveries into the tank are supervised and monitored visually by a member of staff to prevent over filling. The main site containment bund is 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.

3.2.8. The location of the liquid feedstock reception/leachate tank and concrete storage bays are shown on CB2107-05a Permit Boundary and Emissions Plan.

3.2.9. All loads of feedstock arriving at the site by tanker or trailer are 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 that loads are only accepted on the site where there is enough storage and treatment capacity to accommodate the incoming load.

3.2.10. Feedstock material arrives on site in tankers or bulk trailers via the weighbridge. Initial checks are 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 (Appendix 3)**, and includes 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 loading area are ready to receive the vehicle.

3.2.11. Samples will be taken of feedstocks on delivery for analysis as outlined in the **Feedstock Acceptance Procedure (Appendix 3)**. 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 feedstock supply agreement and acceptance criteria for the site. In this instance, the feedstock quarantine and rejection procedure outlined in the operator's Environmental Management System 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.

3.2.12. Wheel washing facilities and temporary foot dips are available at the site should they be needed.

3.2.13. Documentation relating to incoming feedstocks will be retained for at least 6 years for loads received and rejected from the site. Quarterly waste tonnage returns will be made to the Environment Agency as required for regulatory compliance. If 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 is 2-3 days, and in the case of poultry manures, feed materials will be received on a 'just in time' basis and used on the day of receipt.

3.3.2. Solid feedstocks are loaded into one of the three mixing/feeding units located at the site. Where poultry manure is loaded into a feeder unit, a layer of energy crops is placed on the top of the manure to reduce exposure to atmosphere and release of odours. These are top loaded by staff using a telehandler and provide a steady continuous feed to the AD process. Liquid feedstocks are passed directly into the process from the storage tank via a sealed pipeline. A photograph of a feeder unit at the site is shown in Figure 3 below.

Figure 3 – Photograph of a Feeder Unit at the Site

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 the Environment Agency Document 'How to Comply with your environmental permit. Additional guidance for Anaerobic Digestion version 1.0 November 2013, and EA Technical Guidance 'Biological Waste Treatment: Appropriate Measures for Permitted Facilities (Sept 2022).

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, BAT 13a, BAT 22, and BAT 33.

4. TREATMENT

4.1. Treatment

4.1.1. The AD operation is designed to process up to 125,000 tonnes of feedstocks per year. Intended feedstocks are of an 'on-farm' character, consisting of animal manures and slurries, energy crops, and crop residue materials. All feedstocks are received in bulk loads in trailers or tankers.

4.1.2. The fermentation process takes place in a dual-step continuous flow anaerobic process that operates in the mesophilic range (approx. 40ºC) across six digesters (fermenters). There are six digesters at the site, five of them primary digesters, and one a secondary digester. The working capacities of the digesters are; one primary digester at 1664m^3, one primary digester at 2014m^3, three further primary digesters at 2396m^3, and the secondary digester with a capacity of 3301m^3. The digesters are above ground concrete tanks situated on concrete bases and fitted with insulated cladding. All six digesters are fitted with roof mounted double layer weatherproof and UV resistant gas storage bags above the tank space. The total biogas storage capacity above the digesters is approximately 3,662 m^3, 1,100m3/hr of biogas is produced which approximates to 2.86 hours of production. Digesters are fitted with heating coils which utilise hot water for heating of the process tanks. Each digester is fitted with submersible paddle mixers for agitation of substrate.

4.1.3. The digesters are reinforced concrete tanks designed and constructed by Wolf Systems. The design and specification of the tanks ensure a low likelihood of tank failure, and the manufacturer cites a 30-year lifetime for the tanks based on this design. **Design drawings and outline specification from the manufacturer** are included with this document as **appendices 5 and 5a and 6**. The tank manufacturer has over 50 years' experience in the industry and there have been no incidents of tank failures for tanks designed and supplied by this company in that time. The tanks are designed to minimise risk of cracking with the installation of a water stop joint band (water bar) at concrete panel joints to minimise risk of leaks from joints. The manufacturer has provided a maintenance and inspection schedule for the tanks as shown in Table 2 below.

Table 2 – Tank Manufacturer's Recommended Maintenance Schedule

Maintenance Activity	Frequency
External visual inspection of the tank and its components	Once a year
Liquid level checks through appropriate measures	Every 5 years
Internal visual inspection	To be carried out if concerns arise due to ongoing maintenance checks, or there is reason to believe that the methods above are not satisfactory. Recommended that the opportunity for a visual inspection is taken whenever the tank is opened for any reason.

Maintenance Activity	Frequency
Cracks observed to be monitored and kept under observation	Ongoing

4.1.4. The operator has implemented an inspection and maintenance schedule at the site that is in accordance with the tank supplier's recommendations. Internal inspections are carried out when the tanks are opened for de-gritting, and de-gritting is scheduled based on process monitoring data that indicates when tank de-gritting is needed. The most recent maintenance works of this nature took place in January 2021 when two of the digesters were opened, drained down and cleaned. **Photographs taken during this tank opening and cleaning exercise** are now included as **appendix 7**.

4.1.5. Maintenance works carried out on the digesters are scheduled using the site digital maintenance scheduling and recording system. An **example of scheduled works for work undertaken on the tank roofs** is included in **appendix 8** of this document. All other works are scheduled and recorded in a similar manner, and records retained for at least 6 years in accordance with permit requirements.

4.1.6. The tanks are considered fit for purpose due to the specification provided by the supplier, and the fact that the recommended maintenance schedule for the tanks has been and is currently being implemented. The manufacturer states that no secondary containment should be needed as an additional measure to manage risk of tank failure. However, secondary containment is available at the site as an additional measure. The risk of loss of containment from onsite activities is therefore considered to be very low and the status of the primary containment considered fit for purpose and BAT compliant.

4.1.7. The anaerobic digestion process begins in the primary digesters where most of the digestion of the substrate is undertaken and as such most of the biogas is produced. The digesters are 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 is also operated at mesophilic temperatures. There is an average of 39-day hydraulic retention time across the two digestion steps, dependent on final feedstock mixes and primary digester in use. The secondary digester further digests the organic material, ensuring that the substrate is fully degraded prior to final digestate separation and storage. The two-step process allows for maximum possible utilisation of the substrate for biogas production.

4.1.8. Substrate will be processed at a maximum rate of 342t per day of fresh 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 are insulated and clad to achieve maintenance of the set point temperature.

4.1.10. Each digester is fitted with an under/over pressure relief valve that can vent gas to air in the event of a build-up of pressure in the tanks. The tanks are also fitted with high level sensors that will trigger an

alarm and control response if a set point high level is reached and burst plates that will release should liquid release be required (e.g., during foaming incidents). The tanks are fitted with dosing points for dosing with anti-foaming agent and other additives which can be applied if needed. Records are kept regarding the use of pressure relief valves and high level/foaming events 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 in the head of the digesters for biological control of hydrogen sulphide. Ferric hydroxide is also added to the process via the feeder units as a further control measure for H_2S.

4.1.12. Access to the tanks and associated plant, equipment and controls is via galvanised staircases with landings and gantry, allowing safe and unrestricted access for operational maintenance. Each digester is fitted with a viewing port to allow the operator to view the inside of the tanks daily.

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

Table 3: Critical Limits of Digestion Process

Reactor	Parameter	Critical limits
Primary Digester DG01 (1664m^3 wc)	Temperature	42 to 45 ºC
	Minimum HRT	26 days
Primary Digester DG02 (2014m^3 wc)	Temperature	42 to 45 ºC
	Minimum HRT	34 days
Primary Digesters DG03, DG04 and DG05 (2396m^3 wc)	Temperature	42 to 45 ºC
	Minimum HRT	35 days
	Max Organic Loading Rate	TBC
Secondary Digester (3300m^3 wc)	Temperature	42 to 45 ºC
	Minimum HRT	11 days
	Max Organic Loading Rate	TBC
	Substrate Feeding Rate	Maximum of 342t 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. 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.

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 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. If 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 digesters to the secondary digester will stop. If the primary digesters exceed a high-level threshold for levels in these tanks, an SMS alarm will be triggered, and feed to the primary digester from the feeder units will be stopped.

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 are monitored, and the heating system is automatically adjusted accordingly. Any breach of high or low-level thresholds will also trigger an SMS alarm.

4.1.19. Monitoring probes and equipment is calibrated as required/recommended by the instrument supplier, and calibration records are 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. Hydraulic retention time 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 3 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 (programmable logic controllers) and other associated circuits live for 30 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 an emergency backup diesel generator.

4.1.25. Further parameters/operational conditions to be monitored by in situ monitors in the digesters are:

4.1.26. Level of substrate monitored via level meters and triggers high- and low-level alarms; accordingly, and

4.1.27. Volume / capacity of digester tanks utilised (% capacity occupied).

4.1.28. The site operator monitors the health of the digesters on at least a daily basis by analysis of samples on site. Samples are 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 about feedstock and process management to prevent abnormal condition from developing. The **Process Monitoring Plan** attached to this document as **Appendix 4** 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. A photograph of the titration machine from the onsite lab is shown in figure 4 below.

Figure 4 – Site Lab Titration Machine

4.1.29. The site has an automatic closed (ground) back-up flare that can burn gas in a controlled manner, at a minimum of 1,000°C and 0.3 seconds retention time at this temperature. The flare has the capacity to burn total biogas production in the event of CHP or gas grid connection down time e.g., during periods of on-site/grid maintenance. The flare is mounted on a concrete plinth with pedestrian access for inspection and maintenance, in a location that is compliant with DSEAR and ATEX regulations. Photographs of the flare are shown in Figure 5 below.

Figure 5 – Site Flare

4.1.30. Records are kept of the flare use on the SCADA control system, and the reason for its use is documented within the EMS (Environmental Management System) incident documentation process if relevant.

4.1.31. All vessels and pipes are identified on the SCADA system by a unique identifier code that is cited on the master control screens.

4.1.32. Final digestate is pumped from the secondary digester to the separator to allow separation of the final digestate before it is sent to storage.

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 the Environment Agency Document 'How to Comply with your environmental permit. Additional guidance for Anaerobic Digestion version 1.0 November 2013, and EA Technical Guidance 'Biological Waste Treatment: Appropriate Measures for Permitted Facilities (Sept 2022).

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, BAT 5, and BAT 13b.

5. BIOGAS TREATMENT AND STORAGE

5.1. Biogas Treatment and Storage

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 approximately 3,662 m^3, 1,100m3/hr of biogas is produced which approximates to 2.86 hours of production. The gas membranes rise and fall 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 H_2S
- Oxygen O_2
- Carbon Dioxide CO_2
- Methane CH_4

5.1.4. The gas analyser reports data to the SCADA control system on a routine basis. Data reported to the SCADA system will be checked and logged by plant operatives daily. The gas analyser is calibrated per the manufacturer's specification and records of this kept in the plant maintenance records.

5.1.5. Hydrogen sulphide is managed via a combination of biological control within the head of digesters, and dosing of ferric hydroxide/oxide 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/oxide which is in a solid powder form is stored in palleted bags and dosed in the feeder units as needed.

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 and blast plates

which are designed to release the volume of gas passing through the tank if a critical under/over pressure point is reached. These valves and blast plates are last safeguards to protect the tank gas storage. Under normal conditions the gas pressure sensors detect access pressure and if excess biogas is present, triggers the gas flare. The flare can burn biogas as well as biomethane. In case of a breakdown of all consumers on site (biogas upgrading unit, flare and CHP) the flare 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. Condensate naturally forms in the main gas transport line from the AD plant and because of the upgrading process. A dedicated collection system is in place to manage condensate arising in this way. The main collection system is fitted with a level pump switch which returns condensate to the digesters via the condensate return line.

5.1.9. 5. There are four CHP engines at the site, two that operate on liquid natural gas, and two that operate on biogas.

5.1.10. The engines supply heat and power to the AD process and biogas upgrading facility and have the facility to export any excess electricity to the national grid network.

5.1.11. Further details of the engines, their thermal outputs and inputs and commissioning dates are given in document CB2107-17 List of Medium Combustion Plant.

5.1.12. The CHP units are housed in insulated containerised units. Emissions from the CHP exhaust do not exceed those quoted in the planning permission or the Environmental Permit for the site. The energy recovery measures on site are further outlined in section 6 of this document.

5.1.13. The CHP containers are mounted on foundation plinths with safe access provided around the circumference for operational and maintenance activities. The CHPs are fitted with a gas detection system within the CHP container 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.

5.1.14. 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 CHP prevent ingress of dust, airborne particles, and moisture.

5.1.15. All other biogas not utilised in the CHPs for plant operation purposes is upgraded and injected into the national gas grid network.

5.1.16. Upgrading takes place in a biogas upgrading plant supplied by Bright Biomethane. The biogas produced in the digesters is passed through a series of membranes and carbon filters under different gas pressure and temperature conditions to remove VOC's, H_2S and CO_2. Propane and odorant do not need to be added to the final biomethane as it is injected directly into a high pressure main where it will mix with gas in the grid and reach suitable calorific and odorous state in this way. The CO_2 that has been stripped out of the biogas is currently vented to atmosphere but as a change in this variation application, the operator

proposes to install a CO_2 recovery unit to produce food grade CO_2 in liquid state. At the time of writing this application, the operator has informed the Environment Agency of intention to run a trial CO_2 recovery installation at the site, according to RPS 255 (Treating, storing, and using carbon dioxide from anaerobic digestion). The final food grade CO_2 product will comply with the EIGA standard for food grade carbon dioxide (EIGA 70/17) and the operator has carried out an end of waste self-assessment on the material and has found that it will meet the legal end of waste test. The operator is aware that the Environment Agency are in the process of reviewing the Biomethane Quality Protocol and that evidence for inclusion of CO_2 products derived from AD sites is being considered as part of this review. The operator has therefore decided not to seek the EA definition of waste panel opinion on the status of the intended CO_2 product at this stage, but to proceed at this stage on the basis of self-assessment pending any outcome of the QP review process and any potential national position to end of waste for this product.

5.1.17. The CO_2 recovery unit implements a series of process steps to remove other trace gases from the CO_2 and to transform the CO_2 to a liquified state. The CO_2 is subject to compression, cooling and drying and the resulting liquid CO_2 is passed through a distillation column to remove any traces of methane. Methane removed in this process is diverted back to the AD gas storage facility for use in the CHP's and biogas upgrading facility. The final purified liquid CO_2 is stored in a vacuum tank pending removal for use by tanker offtake. There are no emissions to atmosphere from the plant other than for emergency pressure relief. A **process flow outlining the CO_2 recovery process** is included with this document as **appendix 21**.

5.1.18. 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 the Environment Agency Document 'How to Comply with your environmental permit. Additional guidance for Anaerobic Digestion version 1.0 November 2013, and EA Technical Guidance 'Biological Waste Treatment: Appropriate Measures for Permitted Facilities (Sept 2022).

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, BAT 5, BAT13b, BAT 15, and BAT 16.

6. ENERGY RECOVERY

6.1. Energy Recovery

6.1.1. The operator has a number of measures in place to maximise energy recovery and use on site. The CHP engines on site meet the energy needs of the site. Heat from the engine cooling waters is recovered for use in heating of tanks on site via use of a heat exchange system.

6.1.2. Should the CHPs unit stop producing power, the plant will automatically switch over to the import of electricity from the national grid for continued plant operation. There is also an on-site generator for further backup should grid connection be unavailable.

6.1.3. The operator carries out ongoing monitoring of energy export and usage, water and raw material usage, and waste recovery, and carries out regular reviews of potential savings that can be made, both in process areas and from domestic facilities on site.

6.1.4. The operator processes animal slurries and manures and crop residues arising from farming activities in the area to produce energy and agricultural fertiliser and as such by definition the activity itself is designed to achieve reduction in energy usage and recovery of resources.

6.1.5. The installation of the new CO_2 recovery unit to produce a food grade liquid CO_2 product will confer additional energy efficiency and process efficiency benefits to the site.

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 the Environment Agency Document 'How to Comply with your environmental permit. Additional guidance for Anaerobic Digestion version 1.0 November 2013, and EA Technical Guidance 'Biological Waste Treatment: Appropriate Measures for Permitted Facilities (Sept 2022).

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, BAT 22, and BAT 23.

7. DIGESTATE TREATMENT AND STORAGE

7.1. Digestate Treatment and Storage

7.1.1. Following retention in the digesters for the required period, digestate is pumped to a screw press separator for separation into a liquid and solid fibre fraction. Separated fibre falls into the concrete storage bay below the separator and from there is removed for offsite storage or to destination field heaps on farm. Removal is undertaken several times a week and so minimal material is on site at any one time.

7.1.2. Separated liquor is stored within two offsite covered digestate storage lagoons The operator also has access to other storage facilities in the area should these be needed.

7.1.3. The operator has access to 4 to 5 months storage for digestate liquor arising from the site operations. The facilities are outlined in the site **Digestate Management Plan** which is now submitted as **Appendix 9** of this document.

7.1.4. The operator currently produces digestate where the only waste inputs to the process are animal manures and slurries, and as such, the resultant digestates are not currently regulated as wastes. Given that the lagoons are not currently used to store material that is regulated as a waste, there is no requirement for the lagoons to be included in the permitted boundary of the facility.

7.1.5. However, the operator is aware that the approach towards regulation of digestates derived from animal manures and slurries is currently under review as part of the EA's ongoing review of the Digestate Quality Protocol (QP). The operator will continue to monitor the outcome of this ongoing review for any future implications for digestate production, storage and management at the site.

7.1.6. Volumes of separated liquid digestate sent to the lagoon for storage are measured via an online flowmeter.

7.1.7. Digestate is spread by a third-party landspreading contractor.

7.1.8. The operator will ensure that if digestate produced at the site is a waste, it will be spread to land by a landspreading operator who is the holder of a mobile plant landspreading permit for wastes. The operator will ensure that all waste is stored and spread to land according to any waste deployment issued by the Environment Agency. If waste digestate is produced at the site, the operator will consider undertaking measures to achieve end of waste status for digestate produced, based on the regulatory approach to be determined in the future following the published revision of the Digestate Quality Protocol.

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 the Environment Agency Document 'How to Comply with your environmental permit. Additional guidance for Anaerobic Digestion version 1.0 November 2013, and EA Technical Guidance 'Biological Waste Treatment: Appropriate Measures for Permitted Facilities (Sept 2022).

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, BAT 5 and BAT 13a.

8. EMISSIONS CONTROL AND ABATEMENT

8.1. Point Source Emissions

8.1.1. The point source emissions to air and water and associated monitoring points from the plant are outlined in application documents CB2107-05a Site Boundary, and Emissions Points Plan, and CB2107-10 List of Emissions Points.

8.1.2. The potential for air quality impacts from emissions from the CHP engine, the flare, and the biogas upgrading unit have been assessed via dispersion modelling and a report of the findings supplied in an appendix to the application document as CB2107-08 Environmental Risk Assessment. This report concludes that impacts on pollutant concentrations were not predicted to be significant at any human receptors in the vicinity of the site, or to significantly impact on conditions at any sensitive ecological habitat designation.

8.1.3. The gas consumers at the site are subject to regular maintenance, monitoring and re-tuning to ensure optimum performance. The programme of monitoring and maintenance undertaken has been defined in association with the technology providers who provide service and maintenance support. 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 are documented.

8.1.5. All use of the flare and PRV's is recorded and accounted for. The PRV's are checked and maintained regularly as outlined in the site's maintenance programme. The flare is subject to regular maintenance and monitoring checks, as defined in association with the service provider for the flare.

8.1.6. An annual monitoring exercise is carried out for emissions from the CHPs. This is reported to the Environment Agency as required. The sample points have been identified in line with the EA's guidance on 'Monitoring stack emissions: measurement locations' (formerly known as M1 guidance). This monitoring and sample point selection is done in association an MCERTS accredited external contractor who has been commissioned to undertake the exercise. Annual monitoring of the flare will be undertaken if it is used for more than 10% of operational time.

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 CB2107-08 Environmental Risk Assessment. This assessment has concluded that predicted odour concentrations were below the relevant EA odour benchmark level at all residential receptor locations for all modelling years. 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. This now updated plan is included with this application as document reference CB2107-13.

8.1.8. There are three, point source emission of water shown on the emissions point plan. The release point at W1 is for clean surface water derived from concrete surfaces in the CHP and upgrading area compound. This water is currently discharged via a pipe that goes beyond the site boundary and leads to a sealed sump in which the water is retained. The water is then pumped into the AD plant for use in the process. This arrangement has been installed with a view to releasing segregated clean water to soakaway although there is currently no installation of soakaway facilities to allow discharge in this way. Should this change then the operator will apply for a variation to the site permit with updated risk assessment and details of discharge and release arrangements. In the meantime, all surface water drainage from this point is returned to the AD process.

8.1.9. Release points at W2 and W3 are points where clean surface water is released to an adjacent ditch on a batch basis following testing of water quality prior to release. Surface water accumulates in the concrete bunded area in defined low points which are shown in figure 6 below.

Figure 6 – Location of Surface Water Batch Collection Points

Defined collection areas are numbered in green boxes. Testing and release will be undertaken from one or several of these areas. A record will be made of the area tested and released from.

8.1.10. Surface water accumulating in these areas is tested in the onsite lab using a HACH DR1900 benchtop spectrophotometer. The parameters to be tested, and the acceptable benchmark thresholds to allow release are based on those outlined for biological treatment of waste in document reference 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 A. et al, 2018, and are outlined in Table 4 below.

Table 4 – Water Quality Testing Parameter and Benchmarks Levels for Release

Parameter	Benchmark for Discharge	Test Method
COD	180mg/l	On Site Lab Bench Top Spectrometer
Total Phosphorus	2mg/l	On Site Lab Bench Top Spectrometer
Total Nitrogen	25mg/l	On Site Lab Bench Top Spectrometer
Total Suspended Solids	60mg/l	On Site Lab Bench Top Spectrometer

8.1.11. The bench top spectrophotometer will be subject to maintenance and calibration as specified by the manufacturer. A record will be made in the site EMS of all batches released, the area from where the batch was taken, the results of onsite lab testing, the volumes released, and the release point for discharge (W2 or W3). Water will be pumped using a submersible pump and flexible mobile pipe.

8.1.12. All other surface water and run off arising at the site is retained in an internal drainage collection system within the site concreted surface and pumped back into the process.

8.1.13. There is no domestic sewage generated at the site, staff welfare facilities being available at the wider Somerset Farm complex.

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 updated document is included with this application as **CB2107-12.** The operator has also prepared an inventory of all wastewater and gas streams arising at the site which informs a number of management plans at the site, including the fugitive emissions plan. This **wastewater and gas streams inventory** is submitted with this document as **Appendix 13**.

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.

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 odour management plan,** which has been updated in view of the current onsite changes and submitted with this application for further assessment as document reference **CB2107-13**.

8.2.5. The operator has outlined the measures that are in place to control accidental releases and spillages in the **accident management plan**, which is now updated and included with this document as **Appendix 14.**

8.2.6. The site has four CHP engines, two operating on biogas and two on liquid natural gas. The site can run in island mode (should the biogas CHP fail; the LNG CHP will power the site). The site also benefits from an emergency generator installed on site for power supply during power outage.

8.2.7. A **lightning protection system that complies with BS EN 62305** is installed at the site. A letter confirming that the system has been checked and conforms to the standard is included with this document as **Appendix 15.**

8.2.8. A firewater retention lagoon is installed at the farm site with a capacity of 121,500 litres to ensure that adequate supplies of water are available at the site at all times should this be needed for fire suppression purposes.

8.2.9. 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. A fire risk assessment has been undertaken and is reviewed on a regular scheduled basis 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.

8.2.10. 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 an appendix to the risk assessment CB2107-08. The operator has not yet finalised the specification of the CO_2 recovery unit to be installed at the site and so assumed noise levels have been applied to this assessment. The assessment has concluded that there will be no adverse impacts from noise arising from the installation of the new unit, based on assumed values, if the noise emission of the proposed carbon capture plant is limited to 68 dB $L_{Aeq,\,T}$ at 1 m.

8.2.11. As the final specification for the plant has not yet been finalised, there will be the opportunity for the operator to ensure that any final equipment can comply with this requirement. In addition to this, the noise modelling report recommends that further iterations of the model should be undertaken once specific

noise ratings from any final unit can be applied. The pending trial of the equipment at the site prior to final design freeze will also allow the operator to undertake measurements of operational equipment at the site to better inform reiterations of the noise assessment and final specification of equipment that will be BAT compliant. Once the final proposed measures have been finalised, then the noise management plan for the site will be updated on this basis.

8.2.12. The operator has outlined current measures to manage noise arising from day-to-day site operations in the noise management plan document reference CB2107-14. This plan will be updated following final confirmation of specification of the CO_2 recovery unit components to detail any specific measures applied to ensure that the addition of the plant to site operations does not result in noise impacts at receptors.

8.2.13. The liquid feedstock reception/leachate tank and main treatment/processing and storage infrastructure at the site are contained within an impermeable bund. The bund has been sized in order to accommodate a volume of at least 110% of the largest vessel or 25% of the total tankage volume.

8.2.14. Assessments have been undertaken of the suitability of the current bund and conformance to best available techniques. A schedule of uplift works has been agreed with the local officer as outlined in CAR DP3334QW-0404421 Temporary Bund, October 2021. The agreed uplift works were originally scheduled for completion by 28th September 2023. These works are still ongoing and subject to ongoing review and agreement of timeframes for completion of works. A copy of **CAR DP3334QW-0404421 Temporary Bund** is included with this document as **Appendix 16.**

8.2.15. The impermeable surface of the bund is subject to regular visual inspection to check ongoing integrity.

8.2.16. The containment system is designed to meet the requirements of BAT as set out below in the BAT Assessment Statement and will be fully compliant following completion of the agreed uplift works.

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 the Environment Agency Document 'How to Comply with your environmental permit. Additional guidance for Anaerobic Digestion version 1.0 November 2013, and EA Technical Guidance 'Biological Waste Treatment: Appropriate Measures for Permitted Facilities (Sept 2022).

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, BAT 3, BAT 6, BAT 8, BAT 10, BAT 12, BAT 13a, BAT 14, BAT 17, BAT 19, BAT21 BAT 34 and, BAT 35.

9. MANAGEMENT

9.1. Facility Management

9.1.1. The operator maintains a formal controlled environmental management system that is designed to ensure the following:

9.1.2. that environmental risk and impacts are managed proactively

9.1.3. that all legislative requirements are complied with; and

9.1.4. that procedures are in place to enable timely and effective response to environmental incidents should they occur.

9.1.5. 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.

9.1.6. The operator ensures that there is sufficient provision of suitable technical competence for the site and the site is attended for the required number of hours by a holder of a suitable WAMITAB award (MROC5).

9.1.7. The site staff team includes a full-time plant manager, and engineering manager, and operations manager, a lead operator, an operator, and a feed operative.

9.1.8. Staff are trained to use the in-house lab facilities to undertake daily FOSTAC and Dry Matter testing and water quality testing. Samples sent for analyses by external third parties are sent to NRM Laboratories, and biological support is provided by an external company (Omex) who carry out monthly monitoring and reporting of digester process monitoring parameters.

9.1.9. A list of current controlled documents included in the management system for the plant is provided with this application as CB2107-04 Summary of EMS.

9.1.10. The operator has conducted an air quality impact assessment, noise impact assessment and odour impact assessment based on the site operations. The operator has also conducted a qualitative risk assessment based on the ‘source, pathway, receptor’ model. These updated assessments have been provided with this application as CB2107-08 Environmental Risk Assessment and appendices. Based on the outcome of these assessments, the operator has developed several management-plans that detail measures for managing identified risks. 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 **Appendix 14** to this document (**accident management plan**), CB2107-12 Fugitive

Emissions Plan, CB2107-13 Odour Management Plan, and CB2107-14 Noise Management Plan. The noise management plan has recently been reviewed/assessed by the local Environment Agency enforcement officers following response actions by the operator to noise complaints received at the site. The plan submitted with this application is currently understood to be agreed by the local officers as BAT compliant. The plan will be further updated in due course once details of the intended specification of the various components of the CO_2 recovery unit have been finalised.

9.1.11. The **pest management plan** for the site is included with this document as **Appendix 17**.

9.1.12. The environmental management system also includes procedures for reporting, documenting, and investigating incidents, near misses, complaints, and non-compliances.

9.1.13. 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.

9.1.14. 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 are the basis for a staff training needs assessment, which forms the basis of the staff training plan for the site.

9.1.15. 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.

9.1.16. All staff receive training in the implementation of the site's accident management plan.

9.1.17. The training needs/information sharing requirement of contractors visiting the site is 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.

9.1.18. The operator has collated a raw materials inventory detailing tonnage of raw materials used on an annual basis. The nature and volumes of materials used on site is reviewed on an ongoing basis and where possible efficiencies are made, or changes made in the selection of materials used to ensure that low impact options are used wherever possible. This is included in the management system and is provided to support this permit variation application reference CB2107-15 List of Raw Materials.

9.1.19. 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.

9.1.20. 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 (appendix 13).

9.1.21. The operator recovers all digestate arising from the AD plant in use as a fertiliser on arable land at farms in the surrounding area.

9.1.22. The operator has undertaken site survey work and has submitted a Site Condition Report CB2107-06 that documents the characteristics of the site prior to development, as a baseline from which to measure the impact of operations over time. Changes/relevant events/incidents impacting on the characteristics of the site will 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.

9.1.23. The operator has prepared a site Closure and Decommissioning Plan 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. The site **Closure and Decommissioning Plan** is included with this document as **Appendix 18**.

9.1.24. The operator has undertaken a **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 19 and 20** and will be subject to review and update when new infrastructure is introduced at the site.

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 the Environment Agency Document 'How to Comply with your environmental permit. Additional guidance for Anaerobic Digestion version 1.0 November 2013, and EA Technical Guidance 'Biological Waste Treatment: Appropriate Measures for Permitted Facilities (Sept 2022).

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 **Process Monitoring Plan** included with this document as **appendix 4.** 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 exhaust emissions (by MCERTS Certified Consultancy);
- Monitoring/recording of Flare use (on SCADA system);
- Ongoing monitoring of feedstock quality/compliance with agreements/incoming feedstocks procedure;
- Monitoring/recording of use of pressure relief valves on digesters;
- Monitoring of energy and raw material usage;
- Annual Pollution 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;
- Daily odour impact monitoring at receptors (Odour Management Plan);
- Testing of water quality parameters of surface water on a batch basis prior to release
- 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;
- 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 (Site Condition Report submitted; and
- All other monitoring outlined in the various site management plans; odour management plan, fugitive emissions plan, noise management plan, and accident management plan.
- A full list of management system documents is provided with this application as **CB2107-04 Summary of EMS**.

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 the Environment Agency Document 'How to Comply with your environmental permit. Additional guidance for Anaerobic Digestion version 1.0 November 2013, and EA Technical Guidance 'Biological Waste Treatment: Appropriate Measures for Permitted Facilities (Sept 2022).

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, and 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 (CB2107-08).

11.1.2. The receptors in the vicinity of the site have been identified in the updated Environmental Risk Assessment CB2107-08.

- The operator has commissioned an air quality impact assessment based on predicted impacts from the burning of biogas in the CHP engines, and other gas consumers. The results indicated that impacts on pollutant concentrations were not predicted to be significant at any human receptor location in the vicinity of the site. Impacts were also predicted at sensitive ecological habitats. The results indicated that emissions from the plant were not predicted to significantly affect existing conditions at any designation. This report is included with this variation application as document CB2107-08 appendix 1.

- The operator has commissioned a noise impact assessment, and the assessment report is provided as CB2107-08 appendix 3. The noise impact assessment concludes that noise should not be a limiting factor in any permit variation if the noise emission of the proposed carbon capture equipment can be limited to 68 dB LAeq, T at 1 m. This will be taken into account and more detailed reiterations of the noise model undertaken when reaching final design specification of the various components of the CO_2 recovery unit.

- The operator has commissioned an odour impact modelling assessment. This report has been included with this variation application as CB2107-08 appendix 2. This report concludes that predicted odour concentrations were below the relevant benchmark level at all sensitive residential locations in the vicinity of the site for all modelling years. As such, potential odour emissions from the facility are not considered to be significant.

BAT Assessment Statement:

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

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