Document Reference PART C3 3a

Technical Standard and Techniques for Pollution Control (Holbeach Biogas Facility)

1. TECHNICAL OVERVIEW

1.1. Introduction

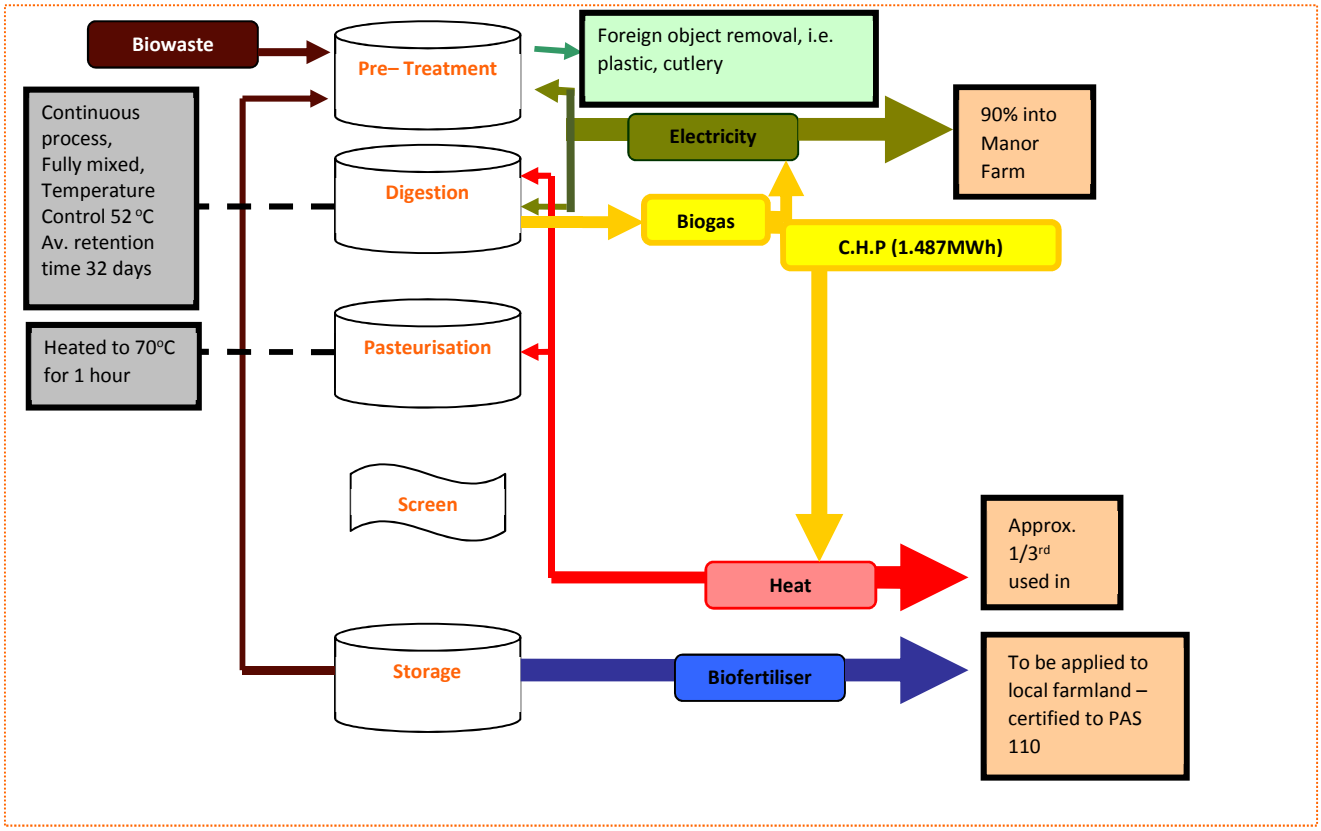
This section provides a technical overview of the Holbeach AD facility and the standards/techniques employed to control emissions from the process.

The environmental benefits associated with anaerobic digestion have been widely recognised. Independent research conducted on behalf of the government has identified AD as the preferred technology due to its impeccable green credentials.

The site is located at Holbeach Hurn, Manor Farm, Spalding, Lincolnshire, East Midlands, PE12 8LW. The NGR is 540493, 328091 and the site occupies an area of 1.9 hectares.

Figure 1.1 illustrates a summary schematic of the Holbeach AD plant

Figure 1.1 Process Flow Diagram for Holbeach AD plant



Process steps

Pre-treatment - Vegetable outgrades and energy crops from neighbouring agricultural farmland and 'similar' commercial food waste is delivered to the plant where it is received onto silage clamp bays after weighing, where it will be visually inspected. From here it is picked up with a materials handler and passed through a hopper to the hammermill equipment, and foreign object traps. As necessary, liquid will be added to form the required constituency before it is transferred into digestion tanks. This liquid can be derived from liquid feedstock deliveries or returned digestate material. Liquid feedstocks are discharged into liquid reception tanks prior to being fed into the process.

Digestion – This is a continuous flow process whereby the feedstock is delivered into the digester at regular intervals. The 'health' of the biological process is closely monitored to ensure optimum conditions for AD. The gas generated is stored in a gas holder in between the head space of the secondary digester before being used as fuel in a combined heat and power unit.

Pasteurisation – The digestate is then pasteurised at 70oC for one hour to remove any pathogens as required by the Animal By-Product Regulations.

Screen – The digestate has a final screening to separate the digestate in to separated liquor and separated fibre, both of which are utilised for spreading around Worth Farms.

Digestate storage – The digestate will be stored in a purpose-built lagoon approximately 650m from site before it is applied direct to land. The digestate produced conforms to PAS 110.

Combined Heat and Power unit – The CHP's convert the biogas into electricity and heat. The electricity will firstly be utilised within the plant and the remainder will be sold via purchase power agreement to the National Grid or to a third-party user. Approximately 1/3rd of the heat is used back in the process to maintain the temperature of the digesters and is also used for pasteurisation.

1.2. Type of facility –

The installation at Holbeach is a Schedule 1 Activity under Section 5.4 A(1)(b)(i) of the Environmental Permitting (England and Wales) (Amendment) Regulations 2013.

The facility can recycle up to 55,000 tonnes a year of vegetable outgrades and energy crops from neighbouring agricultural farmland and a proportion of similar waste derived from the food chain. The structures include a waste reception bays, gas-tight process tanks, gas holder, CHP's and screening for separating liquor and fibre.

The CHPs will generate electricity and transferable heat. Around 33% of this heat is used back in the process to maintain the temperature of the process tanks and is also used for pasteurisation. They have a combined thermal input of 1.487MWth.

2. IN-PROCESS CONTROLS

2.1.1 Material Storage and handling

Indicative BAT	Compliance with BAT
1. Prevention of dust releases during handling of bulk raw materials	Releases of dust from material storage or handling considered to be negligible: ➢ The waste is transported in enclosed or covered containers and good house-keeping measures are deployed. Access to the site is via concreted roads, however sweeping or damping of the site access will be undertaken if required. ➢ The nature of the waste being delivered is not dusty with a typical dry matter of around 23%. ➢ Waste is delivered to site and discharged within reception bays prior to being promptly processed ➢ The pre-treatment, i.e. coarse particle size reduction also takes place within an enclosed building. ➢ The material is discharged from the building into the process tanks via enclosed pipework, in any case, the process is liquid based and therefore any potential dust being released is virtually eliminated.
2. Control of releases of dust to water	Releases of water from material storage or handling are prevented: ➢ The waste reception/handling and storage areas are all within a sealed drainage system whereby any spills/leaks would drain back into the process for treatment. ➢ The external process tanks are within an impermeable bund.
3. Control of releases to land	Releases to land from material storage or handling are prevented: ➢ There will be no direct or indirect discharges of any List I or List II substances ➢ Storage and handling of raw materials occurs within a sealed drainage system, including bunding and will prevent releases to land. Spill control kits are kept on site in the event of a spillage.

Indicative BAT	Compliance with BAT
1. Fuel NOx	➢ The Holbeach facility will use biogas which has low levels of chemically bound nitrogen in the fuel (low fuel N content). This is considered BAT.
2. NOx levels - 500mg/Nm^3	➢ The engines selected can operate at levels of NOx of 500mg/Nm^3 or less which conforms to the German TALUFT standard as stated IPPC Sector Guidance Note Combustion Activities (V2.03 27.07.05).

2.1.3 Primary Measures for Sulphur Dioxide (SOx) Control

Indicative BAT	Compliance with BAT
1. Use of low sulphur fuels – "for smaller scale combustion plant (<20MW(th)), use of low sulphur fuels (i.e. less than 1.2% S) may be sufficient in the consideration of BAT for control of oxides of sulphur emissions"	➢ The Holbeach facility currently utilises a desulphurisation unit as a means of ensuring a low Sulphur content in the fuel. Regular H_2S readings are taking and dosing rates adjusted accordingly to ensure emissions are not adversely affected. ➢ Biogen will maintain research into alternative abatement techniques/chemicals and based on the findings may utilise alternative methods. This will be documented in the company's IMS which is readily available to the EA for inspection upon request.

2.2 EMISSIONS CONTROL

2.2.1. Point Source emissions to air

The point sources are: Exhaust stack from the CHPs, flare.

2.2.2. Abatement of nitrogen oxide emissions

Indicative BAT	Compliance with BAT
1. Abatement of NOx emissions	➢ As highlighted in section 2.1.2 the biogas has low levels of chemically bound nitrogen in the fuel (low fuel N content). The engines selected achieve the levels of NOx suggested by BAT and conform to the German TALUFT standard. ➢ Therefore, no abatement technology for NOx reduction is required.

2.2.3 Sulphur Dioxide Abatement

Indicative BAT	Compliance with BAT
1. Abatement of SO2 emissions	➢ Use of biogas (low sulphur fuel) with less than 1.2% sulphur. Ferric chloride dosing or an alternative is utilised as required to ensure compliance with respect to CHP emissions.

2.2.4 Abatement of particulate matter emissions

1. Abatement of particulate matter emissions	➢ No particulate control is required as biogas has negligible amounts of particles.

2.2.5 Other Releases

1. Abatement of carbon dioxide (CO_2), carbon monoxide (CO) and volatile organic compounds (VOCs)	➢ CO_2 is a greenhouse gas and is recognised for its contribution to global warming. The process of anaerobic digestion generates renewable energy in the form of electricity and heat which would otherwise have been produced from fossil fuels. Furthermore, the facility will produce fertiliser which will replace the need for fossil fuel derived fertilisers. ➢ Processing food waste through AD when compared to landfill prevents the emissions of 958kg of carbon equivalent per tonne of food waste being emitted to atmosphere. ➢ The carbon dioxide arising from organic waste in treatment and disposal is short-cycle (i.e. it was atmospheric CO_2 in the recent past) and therefore is of no consequence for global warming. ➢ CO will be minimised through effective operation of the plant, regular maintenance and good combustion. The levels of CO experienced to date have been well below the 1400mg/m^3 emission limit value. ➢ VOCs will be minimised through good combustion control
2. Abatement of metals, halogens, PAH, dioxins	➢ N/A for biogas.

Flare – flare usage will be minimised where possible, its purpose is to ensure controlled combustion of surplus biogas, primarily as a result of planned and unplanned outages due to maintenance or CHP breakdown. If the flare is used for more than 10% of the operational hours in the year, emissions testing by an MCERTS firm will take place to assess conformance to the upper limits stipulated in the permit.

2.2.6 Point Source emissions to surface water and sewer

All water from within the bunded area is re-circulated back into the process whereby it undergoes full treatment and ultimately forms part of the final product. The reception bays also benefits from a sealed drainage system, directing any leachate and wash-down waters into the process for full treatment.

In summary however:

Indicative BAT	Compliance with BAT
➢ Water use should be minimised and wastewater reused or recycled. ➢ Contamination risk of process or surface water should be minimised. ➢ Closed loop cooling systems to minimise blowdown.	➢ The rainwater from the bunded area is returned to the process to reduce dependence on mains water and to aide processing. ➢ Good housekeeping reduces the risk of contamination, in any case all water within the bunded area is re-used in the process. ➢ No associated blow down water from boiler or cooling systems, in any case water would be directed to sealed system and be treated in the process.

2.2.7 Point Source emissions to groundwater

Indicative BAT	Compliance with BAT
➢ There should be no permitted releases to groundwater of either a direct or indirect nature.	➢ There are no direct or indirect releases to groundwater from the installation. Pollution prevention techniques combined with site design would mitigate the potential for indirect release following an accident.

2.2.8 Control of fugitive emissions to air

Indicative BAT	Compliance with BAT
1. Techniques should be in place to control releases of dust	➢ All vehicles delivering waste will be enclosed or covered and the nature of the waste to be processed has a typical dry matter of around 23%. ➢ All waste will be discharged in the impermeable reception bays prior to being transferred into the sealed process tanks by a closed transfer pumping system. ➢ The site access road is concrete from the highway right through to the site entrance. Good house- keeping of internal routes will prevent mud/debris from being deposited on the highway. ➢ The process is a liquid based system and therefore dust/particulate emissions are unlikely from the separation stage, in any case the separated solids will be stored in a covered/enclosed skip.
2. Techniques should be in place to control releases of VOCs	➢ VOC releases will be insignificant. ➢ Fugitive emissions are prevented by gas-tight process tanks. Once the material reaches the storage tank it is stabilised having undergone full treatment. ➢ Oil tanks are integrally bunded, natural venting will be minimal. ➢ Fugitive emissions of unburned biogas and the operation of the flare will be minimised. The provision of adequately sized CHP plant and the flare will prevent venting of biogas. Any significant fugitive emissions of unburned biogas, including the operation of pressure relief valves and the operation of the flare shall be recorded.

2.2.9 Fugitive emissions to surface water, sewer and groundwater

The site has been designed to ensure that only clean uncontaminated water is discharged from the site. The discharge/unloading, handling and pre-treatment of waste is undertaken within impermeable Reception Bays which benefits from a sealed drainage system. The drainage in the Reception Bays is directed into a sump chamber, this material is then returned to the process for full treatment. All tanks are contained within secondary containment, i.e. a concrete bund.

Spillage kits are located around the site and all employees are trained in accordance with the emergency preparedness and response procedure.

Indicative BAT	Compliance with BAT
1. Sub-surface structures to prevent pollution	➢ All process transfer pipe work is above ground, with underground pipe work being limited to the digestate transfer pipework that tranfers digestate to the nearby offsite lagoon. ➢ Sub-surface and underground structures are subject to daily monitoring.
2. Above ground structures to prevent pollution	➢ The external purpose-built process tanks are situated within an impermeable concrete bund which is designed to capture 110% of the largest tank. ➢ Daily inspections will be undertaken to assess for any possible sources of contamination, i.e. spills/leaks within the bunded area. In any case, all water within the bund is returned to the process and not discharged off site. There is currently no means to discharge water from the bunded area off site. Should this be desirable in the future, it would only be permitted following ammonia testing and visual assessment to demonstrate no contamination and following discussion with the landlord of the Estate and the EA. ➢ Minimal quantities of oil will be stored onsite at any one time, this will be stored in integrally bunded tanks designed to take 110% of the capacity. Fuelling points will benefit from a drip tray where necessary to ensure any spillages are contained and the tank will be secured when not in use. All filling activities will be supervised by a competent member of staff. ➢ Daily management checks include a structural integrity inspection for bunds, surfaces, tanks etc to ensure they remain fit for purpose (in line with the daily checks procedure and checklist).
3. Storage of mobile containers, drums, IBCs etc	➢ Any drums, IBCs or other mobile containers shall be constructed and maintained so that they do not leak any liquids contained in them and will be stored within the building or bund.

2.2.10 Odour

The site resides on a remote farm estate and the nearest receptors are other farm buildings, therefore it is not within a highly sensitive location.

Indicative BAT	Compliance with BAT
1. Odour containment	➢ Liquid wastes will be delivered in enclosed containers; other wastes will be delivered in sealed or covered containers. ➢ Vehicles delivering feedstock unload onto either the enclosed/sheeted maize clamp area or directly into one of the two liquid storage tanks (depending on the particular feedstock type). ➢ Storage period for any other waste stream are kept to a minimum to prevent advanced states of decomposition ➢ Site team completed odour checks daily ➢ Waste processing takes place within an enclosed building with the roller shutter doors closed. ➢ The process tanks are gas tight vessels. All the transfer pipework is sealed and therefore under normal operation, there is no potential for odour release. The integrity of the process tanks will be inspected daily as part of the daily check's procedure. ➢ Gas is stored within the inner gas tight membrane of the secondary digestion tank. The integrity of this membrane is regularly checked. Gas monitoring equipment is used to monitor gas levels. ➢ For further details please refer to document reference Odour Management Plan (Holbeach).

2.3 3 Management

The Integrated Management System (IMS) is accredited to ISO 9001:2015, ISO 14001:2015 and OHSAS 18001. The digestate is also accredited to PAS 110.

Indicative BAT	Compliance with BAT
1. Effective Operations and Maintenance systems	The IMS system includes: ➢ A defined procedure for identifying, reviewing and prioritising items of plant for which a preventative maintenance regime is appropriate. ➢ Documented procedures for monitoring emissions or impacts. ➢ A preventative maintenance programme covering all plant, whose failure could lead to impact on the environment, including regular inspection of major 'non-productive' items such as tanks, pipework, bunds, filters. ➢ Senior management commitment is demonstrated, and regular review meetings are held with senior management to discuss the findings/results of audits.

2. Competence and training to raise awareness and to ensure the key skills required are developed and maintained	The IMS system ensures appropriate training for relevant staff and covers: ➢ Awareness of the regulatory implications of the permit for the activity and their work activities. ➢ Awareness of all potential environmental effects from operation under normal and abnormal circumstances. ➢ Awareness of the need to report deviation from the permit. ➢ Prevention of accidental emissions and action to be taken when accidental emissions occur. ➢ The recording of the skills and competencies necessary for key posts and any training received. ➢ The environmental risks posed by the work of contractors onsite and an assessment prior to works been undertaken. ➢ Relevant employees within the business will hold WAMITAB.
3. Accident Management plan with detail on preventing pollution	➢ An Accident and Near Miss Reporting and Investigation Procedure and an Emergency Preparedness and Response Procedure are in place. These identify the likelihood and consequences of accidents and identifies actions to prevent accidents and mitigate any consequences. ➢ They also cover: - Handling, investigating, communicating and reporting actual or potential non-compliance with operating procedures or emission limits. - Handling, investigating, communicating and reporting environmental complaints and implementation of appropriate actions. - Investigating incidents, (and near misses) - including identifying suitable corrective action.

4. Organisation	Biogen ➢ Adopt an environmental policy and programme which includes a commitment to continual improvement and prevention of pollution, a commitment to comply with relevant legislation and other requirements to which Biogen subscribes. ➢ Have written procedures to incorporate environmental considerations. ➢ Will conduct audits, at least annually. ➢ Will report on annual environmental performance. ➢ Have a fully documented IMS system which is accredited to ISO9001:2015, ISO 14001:2015, OHSAS 18001 and PAS 110. ➢ Have a clear and logical system for keeping records for the following: policies; roles and responsibilities; targets; procedures; results of audits; results of reviews.

2.4 Raw Materials

The list of feedstocks to be accepted on site is listed in figure 2.4 below. The waste feedstock will be stored securely at all times and contained within a sealed drainage system.

The diesel for the telehandlers will be stored in an integrally bunded purpose-built tank and secured when not in use.

Any lubrication oils, waste oils, etc, will be stored on bunded pallets.

Any trace element additives and ferric chloride in use shall be stored on bunded pallets. Unopened IBCs shall be stored on bunded pallets or within the concrete bunded area.

Figure 2.4 Feedstock to be accepted onsite

Type	EWC code[10]
Wastes from agriculture, horticulture, hunting, fishing and aquaculture primary production, food preparation and processing	**Specific sub codes permitted**
Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing	**02 01**
Sludges from washing and cleaning	*02 01 01*
Restriction: Food processing waste and food washing waste only.	
Animal tissue waste	*02 01 02*
Plant tissue waste	*02 01 03*
Including husks, cereal dust, waste animal feeds, off-cuts from vegetable and fruit and other vegetation waste.	
Animal faeces, urine and manure (including spoiled straw), effluent, collected separately and treated off site	*02 01 06*
Wastes from forestry	*02 01 07*
Restriction: Plant tissue waste only.	
Wastes not otherwise specified	02 01 99
Restriction: Spent mushroom compost or discarded mushrooms from commercial mushroom cultivation only	
Wastes from preparation and processing of meat, fish and other foods of animal origin	**02 02**
Sludges from washing and cleaning	*02 02 01*
Restriction: Process water and food washing waste only	
Animal tissue waste	*02 02 02*
Including blood, animal flesh, fish processing waste, fish carcasses and poultry waste.	
Materials unsuitable for consumption or processing	*02 02 03*
Sludges from on-site effluent treatment	*02 02 04*
Wastes not otherwise specified	*02 02 99*
Restriction: Sludges from gelatine production and animal gut contents only.	
Wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production, yeast and yeast extract production, molasses preparation and	***02 03***
Sludges from washing, cleaning, peeling, centrifuging and separation	*02 03 01*
Materials unsuitable for consumption or processing	*02 03 04*
Sludges from on-site effluent treatment	*02 03 05*
Wastes not otherwise specified	*02 03 99*
Restriction – Only: – Sludge from production of edible fats and oils – Seasoning residues – Molasses residues – Residues from production of potato, corn or rice starch	
Wastes from sugar processing	**02 04**
Sludges from on-site effluent treatment	*02 04 03*

Restriction: Biological sludge only	
Other biodegradable wastes	*02 04 99*
Wastes from dairy products industry	**02 05**
Materials unsuitable for consumption or processing	*02 05 01*
Including solid and liquid dairy products, milk, food processing wastes, yoghurt, and whey.	
Sludges from on-site effluent treatment *Restriction: Biological sludge only*	*02 05 02*
Wastes from the baking and confectionary industry	**02 06**
Materials unsuitable for consumption or processing	*02 06 01*
Including condemned food, food processing wastes, biscuits, chocolate, yeast, bread, bakery wastes.	
Sludges from on-site effluent treatment *Restriction: Biological sludge only*	*02 06 03*
Wastes from production of alcoholic and non-alcoholic beverages (except tea, coffee and cocoa)	**02 07**
Wastes from washing, cleaning and mechanical reduction of raw materials	*02 07 01*
– Including brewing waste, food processing waste, fermentation waste	
Wastes from spirits distillation	*02 07 02*
Restriction only: – Spent grains, fruit and potato pulp – Sludge from distilleries	
Materials unsuitable for consumption or processing	*02 07 04*
Including brewing waste, food processing waste, fermentation waste, beer, alcoholic drinks and fruit juice	
Wastes not otherwise specified	*02 07 99*
Restriction Only: – Malt husks, malt sprouts, malt dust – Spent grains – Hops – Yeast and yeast like residues – Sludges from the production process	
Wastes from wood processing and the production of panels and furniture	**03 01**
Waste bark and cork Restriction: Untreated only	*03 01 01*
Sawdust, shavings, cuttings, wood, particle board and veneer other than those mentioned in 03 01 04	*03 01 05*
Restriction: Untreated wood only.	
Wastes from pulp, paper and cardboard production and processing	**03 03**
Fibre rejects, fibre-, filler-and coating-sludges from mechanical separation	*03 03 10*

Restriction: Only allowed if not mixed with, or does not contain, de-inking sludge.	
Sludges from on-site effluent treatment other than those mentioned in 03 03 10	*03 03 11*
Restriction: Only allowed if not mixed with, or does not contain, de-inking sludge.	
Wastes from leather, fur and textile industry	**Specific sub codes permitted**
Wastes from the leather and fur industry	**04 01**
Wastes from leather industry	*04 01 01*
Fleshings may also be described as leather shavings. Restriction: Allowed only if hides and skins, or parts of them, originating from animals that did not show clinical signs of any disease communicable through that product to humans or animals.	
Wastes from the textiles industry	**04 02**
Organic matter from natural products (for example grease, wax)	*04 02 10*
Waste from organic chemical processes	**Specific sub codes permitted**
Wastes from the manufacture, formulation, supply and use (MFSU) of basic organic chemicals	**07 01**
Other still bottoms and reaction residues	*07 01 08**
Restriction: Glycerol residue from biodiesel manufacture from non-waste vegetable oils only	
Wastes packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified	**Specific sub codes permitted**
Packaging (including separately collected municipal packaging waste)	**15 01**
Paper and cardboard packaging	*15 01 01*
Restriction: Not allowed if any non-biodegradable coating or preserving substance present.	
Wooden packaging	*15 01 03*
Restriction: Untreated wood only.	
Composite packaging	*15 01 05*
Restriction: Only allowed if comprised of packaging material otherwise allowed by this Quality Protocol.	
Wastes not otherwise specified in the list	**Specific sub codes permitted**
Aqueous liquid wastes destined for off-site treatment	**16 01**
Aqueous liquid wastes other than those mentioned in 16 10 01	*16 10 02*
Restriction: Allowed only if digestate from an aerobic digestion process that accepts only the waste input types allowed by this Quality Protocol.	
Wastes from waste management facilities, off-site wastewater treatment plants and the preparation of water intended for human consumption and water for industrial use	**Specific sub codes permitted**
Wastes from physico/chemical treatments of waste	**19 02**
Premixed wastes composed only of non-hazardous wastes	*19 02 03*
Restriction: Acceptable only if derived solely from input types allowed by this Quality Protocol and remains segregated from, and uncontaminated by, any other waste type.	

Sludges from physico/chemical treatment other than those mentioned in 19 0205	*19 02 06*
Restriction: Acceptable only if derived solely from physical treatment and/or pH adjustment of input types allowed by this Quality Protocol and remains segregated from, and uncontaminated by, any other waste type.	
Combustible wastes other than those mentioned in 19 02 08 and 19 02 09	*19 02 10*
Restriction: Glycerol only.	
Wastes from the aerobic treatments of wastes	**19 05**
Non-composted fraction of municipal and similar wastes	*19 05 01*
Restriction: Acceptable only if derived solely from input types allowed by this Quality Protocol and remains segregated from, and uncontaminated by, any other waste type.	
Non-composted fraction of animal and vegetable waste	*19 05 02*
Restriction: Acceptable only if derived solely from input types allowed by this Quality Protocol and remains segregated from, and uncontaminated by, any other waste type.	
Off-specification compost	*19 05 03*
Restriction: Acceptable only if derived solely from input types allowed by this Quality Protocol and remains segregated from, and uncontaminated by, any other waste type.	
Wastes not otherwise specified	*19 05 99*
Restriction: Allowed only if: – liquor/leachate from a composting process that accepts only the waste input types allowed by this Quality Protocol; or – digestate from an aerobic digestion process that accepts only the waste input types allowed by this Quality Protocol.	
Wastes from the anaerobic treatment of wastes	**19 06**
Liquor from anaerobic treatment of municipal waste	*19 06 03*
Restriction: Acceptable only if derived solely from input types allowed by this Quality Protocol and remains segregated from, and uncontaminated by, any other waste type.	
Digestate from anaerobic treatment of municipal waste	*19 06 04*
Restriction: Acceptable only if derived solely from input types allowed by this Quality Protocol and remains segregated from, and uncontaminated by, any other waste type.	
Liquor from anaerobic treatment of animal and vegetable waste	*19 06 05*
Restriction: Acceptable only if derived solely from input types allowed by this Quality Protocol and remains segregated from, and uncontaminated by, any other waste type.	
Digestate from anaerobic treatment of animal and vegetable waste	*19 06 06*
Restriction: Acceptable only if derived solely from input types allowed by this Quality Protocol and remains segregated from, and uncontaminated by any other waste type.	
Wastes from wastewater treatment plants not otherwise specified	**19 08**
Grease and oil mixture from oil/water separation containing edible oils and fats	*19 08 09*
Restriction: Grease and oil mixture containing only edible oils and fats only.	
Sludges from biological treatment of industrial wastewater other than those mentioned in 19 08 11	*19 08 12*
Restriction: Allowed only if uncontaminated by potentially polluting materials or substances harmful to anaerobic bacteria.	

Wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise	**19 12**
Other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11	19 12 12
Restriction: Acceptable only if derived solely from input types allowed by this Quality Protocol and remains segregated from, and uncontaminated by any other waste type.	
Municipal wastes and similar commercial, industrial and institutional wastes including separately collected fractions	**Specific sub codes permitted**
Separately collected fractions	**20 01**
Paper and cardboard	*20 01 01*
Restriction: Not allowed if any non-biodegradable coating or preserving substance present.	
Biodegradable kitchen and canteen waste	*20 01 08*
Edible oil and fat	*20 01 25*
Wood other than that mentioned in 20 01 37	*20 01 38*
Restriction: Untreated wood only. Not allowed if any non-biodegradable coating or preserving substance present.	
Garden and park wastes (including cemetery waste)	**20 02**
Biodegradable waste	*20 02 01*
Including animal faeces, manure, garden waste, green waste, horticulture waste, plant tissue, parks and garden waste, hedge and tree trimmings, grass cuttings and leafy materials.	
Other municipal wastes	**20 03**
Mixed municipal waste	*20 03 01*
Restriction: Allowed only if separately collected biodegradable wastes otherwise allowed by this Quality Protocol. If former foodstuffs are packaged, the restrictions given above on packaging wastes apply.	
Waste from markets	*20 03 02*
– Restriction: Allowed only if source segregated biodegradable fractions. Examples are plant material, fruit and vegetables – Restriction: Packaging waste from a market source is allowed only if it is otherwise allowed by this Quality Protocol.	

Biogen adhere to strict waste acceptance criteria and undertake quality assurance checks on the incoming waste to ensure it conforms to the acceptable wastes; these procedures are documented in the IMS.

2.4.2 Waste Minimisation

The site has been designed to minimise the use of raw materials. The CHP's will be driven by burning the biogas generated by the process. The use of water from the bunded area will aide processing, reducing the volume of mains water required.

Key operational features for waste minimisation are:

- The ongoing identification and implementation of waste prevention opportunities
- The active participation and commitment of staff at all levels including, for example staff suggestion schemes

- Monitoring of materials' usage and reporting against key performance measures

Indicative BAT	Compliance with BAT
1. The operator should carry out a waste minimisation audit at least every 4 years	➢ Waste minimisation audits will be undertaken under the IMS and the findings of such audits recorded and made available to the EA upon request. The audits will explore areas such as efficiency, change in process and waste reduction and any areas for improvements.

2.4.3 Water Use

Water efficiency audits will form part of the IMS and will concentrate on the frequency of monitoring and will explore opportunities for further reductions in water usage and opportunities for water re-use. However, it is important to recognise that improvements may be limited due to their inclusion in the initial design.

Indicative BAT	Compliance with BAT
1. The operator should carry out a regular review of water use (water efficiency audit)	➢ A water efficiency audit will be undertaken within two years of the issue of the permit variation with a view to establishing water efficiency objectives and for identifying methods for reducing consumption. Water usage will be included as an IMS KPI where usage could be further minimised and it is deemed as a significant aspect.
2. Water efficient techniques should be used; water should be recycled where possible and uncontaminated water used in the process.	➢ Water efficiency will be considered for equipment purchased with a view to purchasing water efficient kit. ➢ Rainwater from the bunded area will be returned to the process to aide processing and minimise
3. Minimise the risk of contamination of surface waters or groundwater by fugitive releases of liquids or solids	➢ The site is designed to allow only clean uncontaminated water to be discharged from site.

4. The water quality requirements associated with each use should be established, and the scope for substituting water from recycled sources identified and input into the improvement plan.	➢ The areas where water is required has been identified i.e. wash down, gas cleaning unit etc. The usage for these functions shall be minimised. ➢ The plant has been designed such that digestate, rather than water, can be re-circulated and blended with incoming feedstock to achieve a consistency that can be readily pumped. The use of digestate for this purpose will reduce the need to mix with water, thus reducing water consumption.
5. Waste water will need treatment	➢ All wastewater from the process is recirculated to the sealed drainage system and is therefore treated through the AD process, ultimately forming the digestate which is accredited to PAS 110.
6. Water usage for cleaning and washing down should be minimised	➢ Water usage is closely monitored and minimised where possible.
7. Fresh water consumption	➢ Fresh water usage will be monitored regularly. Any significant changes in consumption will be investigated and accounted for; if necessary the frequency of readings will be increased.

2.5 Waste Handling

Indicative BAT	**Compliance with BAT**
1. A system should be in place and maintained which records the quantity, nature and origin of any waste that is disposed of or recovered	➢ Waste Accepted on-site for recovery: The waste types accepted onsite are included in figure 2.4. ➢ The IMS and site records will record the quantity, nature and origin of any waste that is disposed or recovered – and, where relevant, the destination, frequency of collection, mode of transport and treatment method for these wastes.
2. Wastes should be segregated wherever practicable, and the disposal routes identified	➢ This is documented within the accredited IMS and duty of care paperwork.
3. Records should be maintained for any waste sent off-site	➢ Duty of care paperwork will be maintained for a minimum of three years for any waste sent off site. Only licensed waste carriers will be appointed to remove waste off site.

4. All appropriate steps should be taken to prevent emissions from waste storage or handling (e.g. liquid/solid spillage, dust, VOC emissions, and odour)	taThe transfer of material between gas-tight process tanks occurs through enclosed pipework.
5. Waste streams shall be collected in containers which are managed in a way to prevent the release of waste, dust or leachate.	➢ Waste oil and other hazardous waste will be stored in fit for purpose containers.

2.6 Waste Recovery or Disposal

The site is designed such that it can recover a variety of feedstocks; these are listed in figure 2.4. Minimal quantities of waste are generated onsite and this typically consists of contamination brought in with loose food waste. The amount is however, minimal.

Small quantities of waste oil and oil filters will be produced from the servicing of the CHP's, this will be
sent to a suitably licensed waste facility and recycled/recovered where possible.

Indicative BAT	**Compliance with BAT**
1. Waste should be recovered, unless it is technically or economically impractical to do so	➢ Biogen will seek to minimise the quantity of waste produced by the process. Where the waste is packaging waste it will be recovered where practicable.
2. Where waste must be disposed of, the operator should provide a detailed assessment identifying the best environmental options for waste disposal.	➢ This will be covered under the IMS system. However, a detailed assessment is not considered necessary given that only small volumes will be generated. Justification will be given where recovery is not possible.
3. Waste disposal/recovery audits should be undertaken to ensure the waste is being properly handled and dealt with.	➢ Audits are included in the IMS and all records stored on the electronic IMS system.
4. Small quantities of material collected on filters or resulting from spillages should be collected and contained until reasonable quantities are available	➢ Waste handling and disposal procedures are included within the accredited IMS to ensure they are stored and disposed of in an environmentally sound manner.
5. Wastes should be sampled and characterised at an appropriate frequency to ensure they may be accepted.	➢ This is done as required under the duty of care. In respect of materials being accepted to site, they undergo full waste acceptance criteria testing.

2.7 7 Energy

This section addresses the energy efficiency of the technology under the scheme:

Basic Energy Requirement (1) –

Indicative BAT	Compliance with BAT
1. The operator should provide annually the energy consumption information.	➢ The energy consumption will be recorded and available for inspection to the EA.
2. The operator should provide the Specific Energy Consumption (SEC)	➢ This is provided below.
3. The operator should provide associated environmental emissions	➢ Emissions of SO_2, CO_2, CO and NO_x are provided in section 2.1.2, 2.1.3 and 2.2.

*the plant produces energy in the form of electricity and heat; excess electricity will mainly be used on Worth Farm or alternatively fed into the national grid.

Basic Energy Requirement (2) –

Indicative BAT	Compliance with BAT
1. Operating, maintenance and housekeeping measures	➢ Operation of the plant will be in a manner that ensures efficient operation. Checklists will seek to ensure appropriate measures are taken.
2. Basic low-cost physical techniques	➢ The plant will be insulated to minimise energy requirements. ➢ The plant will use a combination direct start and soft start with inverter drives. In the main any motor over 10kw will use a soft start to lower the torque loading for these motors, therefore reducing the electricity usage. The energy required for running the motors will all be generated from the CHP's within the plant and therefore will all come from renewable energy.
3. Energy-efficient building services should be in place to deliver the requirements of the building services	➢ The biogas is used to produce electricity and heat through the CHP units. The heat produced will be utilised within the process itself, not all of the heat produced is required and therefore there will be a need to evacuate some of the heat arising from the engines. ➢ The site is designed and the process tanks and building insulated to ensure energy efficiency.

4. Energy management techniques should be in place, noting, in particular, the need for monitoring of energy flows and targeting of areas for reductions	➢ The CHPs are under premium O&M and will therefore be monitored to ensure maximum efficiency. The O&M contract includes 24/7 remote monitoring and management. ➢ The company includes KPI targets for generation and these are continually monitored by the senior management team.
5. An energy efficiency plan should be provided	➢ An energy efficiency plan will be in place and any recordings will be made available for inspection by the EA.

2.8 Accidents

The general management techniques were discussed in the management section; however this section seeks to cover activity following an accident or abnormal operation.

Indicative BAT	**Compliance with BAT**
1. A formal accident management plan should be in place	➢ A plan has been drawn up which identifies the risks to the environment during an accidental release/abnormal operation – this is documented in the IMS. ➢ An Emergency Preparedness and Response Procedure is also in place which identifies the actions and persons to notify. This covers a variety of scenarios from loss of containment, fire/explosion, vandalism, security threat, injury, etc.
2. Identification of the hazards	➢ The plan incorporates the following: Transfer of substances; overfilling of vessels; emissions from plant or equipment, failure of containment; failure to contain firewater; wrong connections made in drains or other connections; incompatible substances allowed to come into contact; unexpected reactions; release of an effluent before adequate checking of its composition; failure of main services; operator error and vandalism.
3. Assessment of the risks	➢ The plan includes the following: frequency, risk evaluation of the event, pathways to receptors, effects, overall risk and significance and risk management.

4. Identification of the techniques necessary to reduce the risks	➢ The techniques specified in the IPPC sector guidance note are discussed in more detail in the table below.

Techniques IPPC guidance recommends should be in place	**Techniques to be in place at the installation**
1. Up-to-date inventory of substances present	➢ A record of raw materials will be held onsite.
2. Procedures for checking and handling raw materials	➢ Waste Acceptance and Handling procedures are in place. These are included on the electronic IMS.
3. Storage for raw materials, products and wastes should minimise risk to the environment	➢ The Reception Bays benefits from a sealed drainage system. The process tanks and storage tanks are within a bunded area. Diesel will be stored within an integrally bunded tank which will conform to the Oil Storage Regulations. Lubrication oil both new and used will also be stored on bunded pallets.
4. Automatic process controls backed-up by manual supervision	➢ Remote monitoring allows for process checks, automated alarms for level sensors/pressure gauges will alert the site manager and relevant persons. The CHPs are under full O&M and therefore will be monitored by a call centre on a 24/7 basis. ➢ Protection devices such as high-level sensors will be hard-wired to automated valves as identified in the HAZOP study.
5. Physical protection should be in place	➢ The site benefits from crash barriers where appropriate. ➢ Vehicles are guided in by trained banksmen.
6. Techniques and procedures should be in place to prevent overfilling of tanks	➢ A HAZOP study will be completed and additional high-level protection devices installed. These are hard-wired to automated valves and are fail-safe, shutting down relevant parts of the process in the event of being triggered. ➢ Additional flood probes shall be installed in strategic locations of the plant, upon activation these send an alert to relevant personnel. Flood probes (where appropriate) are linked to the relevant automated valves. ➢ Regular checks are conducted on the level instrumentation which also feeds back to the SCADA. ➢ Diesel/oil filling activities will always be supervised to prevent overfilling.

7. Security systems to prevent unauthorised access should be provided where appropriate	➢ The site benefits from palisade security fencing, the gate will always remain locked when the site is not manned. ➢ The SCADA is regularly checked out of hours for any process anomalies which could include acts of vandalism. ➢ The CCTV system allows for remote access for periodic checks on the site out of hours. ➢ Farm security also on 24/7
8. Formal systems for logging and recording all incidents, near misses, abnormal events, changes to procedures and significant findings of maintenance procedures	➢ The company operate an electronic management system which includes the formal reporting of all incidents (including environmental), near-misses. These are regularly reviewed by the senior management team and there is full traceability from the raising through the closure of such reports. ➢ The electronic management system also gives full traceability of changes to standard operating procedures, risk assessments, etc and assists with full document control and record retention.
9. Procedures for responding to and learning from incidents, near-misses etc	➢ The electronic management system prompts for root-cause-analysis to learn from such incidents and improvement logs are raised where appropriate. ➢ The details and findings are also shared with the teams across multi-sites to ensure learning. ➢ Formal toolbox-talks (TBTs) are communicated. ➢ Formal training will also be rolled out as required. ➢ Regular operations meetings take place to discuss significant incidents/near-misses and more formal quarterly operations meetings are held.
10. The roles and responsibilities of personnel involved in incident management should be formally specified. Clear guidance must be available on how to manage different scenarios.	➢ The Emergency Preparedness and Response Procedure and Emergency Contact List defines the roles and responsibilities. Training on this procedure is also included as well as unannounced annual emergency drills. ➢ The procedure and the drills cover a variety of different scenarios, including but not limited to, loss of containment, fire/explosion, security threats, injury, etc.

11. Safe shutdown procedures	➢ Standard activities are covered under standard operating procedures. ➢ Non-routine work is covered by the company's permit to work system and the approved risk assessment and method statement for the works. ➢ A site shut-down checklist is completed and conformation of secure shut down at the end of the working day sent to the senior management team.
12. Communication channels with emergency services and other relevant authorities should be established	➢ The company encourage site familiarisation visits with the fire service. ➢ Site emergency documents are stored to allow easy access in the event of an emergency (to include site drainage, isolation points, key contact details, etc).
13. Appropriate control techniques should be in place to limit the consequences of an accident, such as isolation of drains, provision of spillage equipment, alerting of relevant authorities, evacuation procedure etc	➢ This is covered in the Emergency Preparedness Procedure, Spill control, Emergency contact list, emergency map, etc to ensure the safety and personnel and protection measures for the environment.
14. Training requirements should be identified and training provided	➢ A Skills and Competency Matrix is in place which identifies the training needs of the roles within the business. This features part of the accredited IMS and is frequently updated.
15. Prevention of fugitive emissions including drainage systems	➢ The bund sump is returned to the process. In the event it was to be discharged in the future it would only be done following testing to ensure it remained uncontaminated and with the knowledge of the EA and landlord. ➢ The company are to undertake an assessment of the drainage system to ensure the drainage plan reflects the as-built. ➢ Any changes/connections to the drainage system are required to go through the Control of Change process which requires full consideration and sign off by Compliance to ensure it does not introduce the risk of fugitive release.

The site is not subject to the Control of Major Accidents Hazards Regulations (1999) (COMAH). The double membrane biogas holder capacity falls below the thresholds specified in the COMAH regulations.

2.9 Noise

The site resides on a remote farm estate and the nearest receptors are other farm buildings, therefore it is not within a highly sensitive location.

The main sources of noise and/or vibration (including infrequent sources), the noise sensitive locations and the techniques and measures used for the control of noise are identified.

Indicative BAT	Techniques in place at the installation
1. Identification of the main sources of noise and vibration (including infrequent sources), the nearest noise sensitive locations and relevant environmental surveys which have been undertaken, and the techniques and measures used for the control of noise.	➢ If noise becomes a problem on site, a Noise Management Plan (NMP) will be implemented
2. The operator should employ basic good practice measures for the control of noise, including adequate maintenance of any parts of plant or equipment.	➢ All plant will be regularly serviced and maintained (preventative maintenance as per the accredited IMS).
3. The operator should ensure that the noise from the installation does not give rise to reasonable cause for annoyance.	➢ Distance from noise sensitive receptors and the controls built into the design will prevent reasonable cause for annoyance from noise.
4. Creeping background, noise control measures should minimise this	➢ Periodic noise monitoring will be undertaken.

Noise and vibration sources/proximity to receptors –

The principle noise sources will be the CHP units; however, these benefit from acoustic housing to control the noise at source.

Noise monitoring/assessment will be undertaken in the event of noise complaints, a report and remedial actions will be recorded and made available to the regulatory bodies upon request.

2.10 Monitoring

This section describes the monitoring and reporting requirements for emissions to all environmental media.

Indicative BAT	Techniques in place at the installation
1. Monitoring should generally be undertaken during all phases of operation (i.e. commissioning, start-up, normal operation and shutting-down).	➢ Monitoring will be undertaken during all phases of operation.

2. Continuous monitoring (or at least sampling in the case of water) and recording are likely to be required under specified conditions	➢ Gas quality is monitored continuously for the supply to the CHPs and for monitoring the health of the process. ➢ Temperatures, flow, feed rates, tank levels, open/closed status of valves etc, are monitored and displayed on the SCADA. ➢ Biological monitoring of the process is not continuous, the frequencies are documented within the IMS but typically this is done 3 times per week under steady state, provision for additional testing is considered if process control parameter limits were to be triggered. ➢ The CHPs stacks are not continuously monitored, these are tested annually as stipulated by the permit.

Monitoring emissions to air –

Indicative BAT	Techniques in place at the installation
1. Where appropriate, periodic visual and olfactory assessment of releases should be undertaken to ensure that all final releases to air should be essentially colourless, free from persistent trailing mist or fume and free from droplets	➢ Daily olfactory assessments are undertaken, and the findings recorded. ➢ Periodic visual assessments will also be made on stacks to ensure no changes in colour.
2. The EA has established MCERTS underpinning stack emissions monitoring.	➢ The annual emissions stack monitoring will be undertaken by an MCERTS accredited firm.

Monitoring emissions to water and sewer –

There will be no discharge of substances/effluent to surface water or sewer. The only water that may be discharged from site is clean uncontaminated water from the yard area. The water from the bunded areas will be collected in a sealed sump and returned to the process, only with prior agreement from the landlord and EA, and following testing to demonstrate it is uncontaminated could this be discharged in the future.

Monitoring of waste emissions -

Indicative BAT	Techniques in place at the installation
1. For waste emissions, the following should be monitored and recorded: ➢ The physical and chemical composition of the waste. ➢ Its hazard characteristics. ➢ Handling precautions and substances with which it cannot be mixed.	➢ Waste arising from the process will be stored and disposed/recycled in accordance with the Duty of Care. ➢ Minimal quantities of hazardous waste such as engine oil, filters etc., will be stored in separate containers and sent to a suitably licensed facility. ➢ All duty of care paperwork will be kept for a minimum of three years and be made available for inspection. ➢ The handling of different waste categories, for example, hazardous or general wastes is set out within the companies accredited IMS.

2.10.2 Environmental Monitoring (beyond installation) –

There is no requirement for an effluent treatment plant as there are no effluent discharges from the site.

An on-farm weather station is used to guide monitoring checks to include olfactory and noise. The weather station is also utilised when planning and undertaking planned works on site. The site benefits from a sealed drainage system and impermeable ground; this combined with daily management checks negates the need for soil monitoring surveys.

Indicative BAT	Techniques in place at the installation
1. Should consider the need for environmental monitoring to assess the effects of emissions to controlled water, groundwater, air or land, or emissions of noise or odour.	➢ There will be no emissions to controlled water, neither surface waters nor groundwater and therefore no offsite monitoring will be required. The IMS, including Emergency Preparedness and Response, covers actions/monitoring in the unlikely event of a pollution incident. ➢ Olfactory monitoring 'sniff tests' will be undertaken daily at the site perimeter; off-site olfactory monitoring will also take place. Representative monitoring points will be identified. ➢ Monthly performance checks will take place of the abatement. ➢ More detailed monitoring will take place annually to assess the performance of the odour abatement equipment.

2. Environmental monitoring may be required when: • There are vulnerable receptors • The emissions are a significant contributor to an EQS that may be at risk • The operator is looking for departures from standards based on lack of effect on the environment • To validate modeling work	➢ Routine monitoring of the performance of the odour abatement will take place. ➢ The emissions from the site are not considered significant, annual stack emissions monitoring will be undertaken by MCERTS organisation.

2.10.3 Monitoring of Process Variables –

As previously mentioned, the exhaust stacks from the CHP's will be monitored annually. In addition to the exhausts, monitoring of the process variables will also be undertaken which will include the following parameters:

- Biogas content – CH_4, CO_2, H_2S, O_2
- Biogas flow
- Gas flow to surplus gas burner & boilers
- Gas levels
- Biological process monitoring

2.11 Closure

The design and management techniques deployed at the site will prevent pollution risk upon definitive cessation of activities.

Indicative BAT	**Techniques in place at the installation**
1. Operations during the permit should not lead to any deterioration of the site. A coherent record of the state of the site throughout the period of the permit is required	➢ Records on any incidents/activities which may have given rise to pollution will be recorded and documented in the IMS, this will also include any results of testing or remedial action taken.
2. Care should be taken at the design stage to minimise risks during decommissioning.	➢ Consideration was given at the design by the previous company: - Underground tanks and pipework were avoided where possible with the exception of the digestate transfer pipeline to the off-site lagoon.

	- There is provision for the draining and clean- out of vessels and pipework prior to dismantling. - Insulation is provided such that it can be readily dismantled without dust or hazard. - Where possible materials will be reused, recycled or recovered as parts of the site in its entirety are decommissioned.
3. Site closure plan should be maintained to demonstrate that, in its current state, the installation can be decommissioned to avoid any pollution risk and return the site of operation to a satisfactory state	➢ The site closure plan will be developed and will include: Procedures for the flushing out of pipelines and vessels where appropriate and their complete emptying of any potentially harmful materials, plans of all underground pipes and vessels, records of any pollution incidents and the SCR. Upon request this document will be available for inspection by the EA.

2.12 Installation Issues

The applicant is the only operator of the installation.

1. Emissions

To air - The proposed emission limits are specified in the table below, the limits assume full load.

To water – There are no discharges to controlled water other than clean uncontaminated surface waters.

To sewer - There is no discharge to sewer from the facility.

Proposed emission limit values (ELVs) monitoring emissions

Release point	**Source**	**Parameter & limit/unit**	**Monitoring Frequency & method**	**Location**
CHP 1	1.487M Wth CHP engine	NO_x – 500mg/m^3 CO - 1400mg/m^3 VOCS – 1000mg/m^3 SO_2- 350mg/m^3	Annually in accordance with the latest BS EN as stipulated in the Environmental Permit.	Point A1 on the site plan in Sch 7.
Surplus Gas Burner	Flare	NO_x – 150mg/m^3 CO – 50 mg/m^3 VOCS – 10mg/m^3	Emissions testing required if operational for >10% of the year	Point A3 on the site plan in Sch 7.

The above limits will assume emission levels at NTP and 5% O_2 and are set assuming full load.

In addition to the release points above, the PRVs and odour abatement stack release points shall be identified on the Site Plan.

4.2 Environmental Permitting Regulations

This section seeks to look at the objectives from the regulators perspective. The risks and the methods deployed have been discussed in greater detail throughout this report; however, this section seeks to provide a brief summary of how the objectives have been met.

The objectives include:

- Ensuring the waste is recovered or disposed without endangering human health and w/o using processes or methods which could harm the environment and particular w/o:
  - Risk to water, air, soil, plants or animals, or
  - Causing nuisance through noise or odours, or
  - Adversely affecting the countryside or places of special interest

Risk to water, air, soil, plants or animals –

The site has been designed such that any potentially contaminated water is directed into the sealed drainage system.

The site has been designed such that releases to air are minimised, waste handling and initial processing takes place within Reception Bays and all process tanks are gas-tight.

The exhaust stacks from the CHP will be monitored annually for the appropriate determinants to ensure they are within the emission limit values.

Causing nuisance through noise or odours –

The principle noise sources will be the CHP units; however, these benefit from acoustic controls which are engineered to control the noise at source. The building ventilation and extraction system fans are external to the building, regular servicing/maintenance will take place to minimise noise breakout.

The system has been designed such that the delivery and treatment of the waste takes place within a sealed system. The external process tanks are all gas tight, the screening stage and digestate store consists of treated material and therefore the risk posed by these is minimal. However, additional abatement is also present to treat any displaced air in the digestate tank and the airspace between the inner and outer back of the gas holder. These are highlighted on the Site Plan in Schedule 7.