



Environmental Permit Application Document
Arrow Bio Waste Recycling Facility, Deeside

Prepared for:

Deeside SPV Ltd

By:

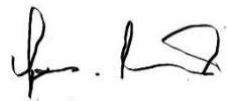

ENVIROSOLUTION LTD

Suite 53
3a Bridgewater Street
Liverpool
L1 0AB

Date: March 2025



EnviroSolution Ltd Document Verification

Site Address	Arrow Bio Waste Recycling Facility, Weighbridge Road, Deeside Industrial Park, Deeside, CH5 2LL		
Report Title	Environmental Permit Application Document		
Job Number	ES2502	Document Ref.	ES2520-15
Date Issued	20/03/2025	Report Version	V2
Prepared by	James Meredith	Signature	
Checked by	Gemma Lucas	Signature	

Disclaimer

This report has been prepared by EnviroSolution Ltd who has exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope.

However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to EnviroSolution Ltd, which have not been independently produced or verified, EnviroSolution Ltd, gives no warranty, representation or assurance as to the accuracy or completeness of such information.

Contents

1. Introduction

- 1.1 The Operator and Related Companies
- 1.2 Site Location
- 1.3 Sensitive Receptors
- 1.4 COMAH Status

2. Process Description

- 2.1 Waste Reception and Depacking
- 2.2 Anaerobic Digestion
- 2.3 Pasteurisation
- 2.4 Digestate Storage and Management
- 2.5 CO₂ Recovery and Liquifaction System

3. Biogas Treatment, Storage and Energy Recovery

- 3.1 Biogas Collection and Storage
- 3.2 Biogas Treatment
- 3.3 Biogas Upgrading
- 3.4 CHP and Boiler
- 3.5 Flare

4. Emissions Control and Abatement

- 4.1 Air Emissions
- 4.2 Emissions to Water
- 4.3 Fugitive Emissions
- 4.4 Containment

5. Management

- 5.1 Environmental Management System
- 5.2 Competence and Staffing
- 5.3 Training
- 5.4 Maintenance

6. Monitoring

- 6.1 Process Monitoring
- 6.2 Emissions Monitoring
- 6.3 Resource and Compliance Monitoring

7. Impact Assessment

8. Closure and Decommissioning

Appendices

List of Appendices

- Appendix A – Design and Access Statement
- Appendix B – Waste Recovery and Waste Codes
- Appendix C – CHP Drawings
- Appendix D – Flood Consequence and Conceptual Surface and Foul Water Management Plan
- Appendix E – Storage of Waste Description
- Appendix F – Environmental Risk Assessment
- Appendix G – Environmental Statement: Drainage and Flood Risk
- Appendix H – Propane Storage and Firewall Details
- Appendix I – COMAH Information
- Appendix N – Accident Management Plan
- Appendix O – Pest Management Plan

1. Introduction

This document is submitted in support of an Environmental Permit application for the Arrow Bio Waste Recycling Facility at Deeside Industrial Park, Flintshire Enterprise Zone. The Installation will process up to 149,000 tonnes of food wastes per annum in the form of solid packaged and unpackaged materials, and pumpable liquid wastes. The source of the waste is likely to come from food businesses and some of the local county councils (assuming 50-mile radius initially) in the form of waste trucks. The vision for the project is to provide a technologically advanced facility for the complete treatment of food waste, utilising BioConstruct GmbH's anaerobic digestion technology.

In accordance with the Industrial Emissions Directive 2010/75/EU the facility will operate as an installation under a bespoke Environmental Permit. It is a requirement of the environmental permitting regime that Operators must apply Best Available Techniques. The Operator commits to ensure that all relevant aspects of the NRW Technical Guidance Note 'How to comply with your Environmental Permit. Additional Guidance for: Anaerobic Digestion' (LIT 8737, v1.0 Nov 2013) and the European Commission BAT Reference Document for Waste Treatment (Pinasseau et al. 2018) will be met, ensuring that the facility will be fully BAT compliant and operable without adverse impact under the conditions of an Environmental Permit.

The operation is designed to process up to 149,000 tonnes of waste per year received as either packaged or unpackaged solid wastes and pumpable liquid wastes. Biogas will be stored in gas membranes in the headspace of the digesters and digestate storage tanks before being upgraded to biomethane for injection into the national gas grid network via a DMT Environmental Technology biogas upgrading and CO₂ liquefaction plant. Three Combined Heat and Power (CHP) engines will provide electricity for operations at the site. There will be one MTU 16V4000 GS CHP unit with a rated electrical output of 2,028 kW and two MTU 12V4000 GS CHP units each with a rated electrical output of 1,521 kW. A 1 MW natural gas emergency boiler (Viessmann Vitoplex 200) will operate during emergency or atypical operations.

1.1 The Operator and Related Companies

The Operator is BioConstruct NewEnergy Ltd.
Company number: 09112259
1 Navigator Court, Preston Farm Industrial Estate,
Stockton-On-Tees, TS18 3TQ
Contact: d.smith@bioconstructnewenergy.com
Darren Smith – Senior Manager – 07860533833

1.2 Site Location

The site is situated within the district of Deeside, in Flintshire, North Wales within Zone F, Renewable Energy Park of the Deeside Enterprise Zone. It lies 2.5 km west of the A550 and 840 m south of the A548, and approximately 2.6 km north of Connah's Quay and 10 km northwest of Chester City Centre. The National Grid Reference for the site is SJ 31114 71232.

The application site comprises an area of vacant brownfield land. The former use of the site was Shotton Power Station, a 210-megawatt gas-fired combined heat and power generating station which ceased generating in June 2012. The site covers approximately 5.6 hectares and is generally flat, sloping gradually down to Weighbridge Road along the western boundary.

The site is bounded by: the Parc Adfer/Wheelabrator Energy Recovery Facility to the north; the Borderlands railway line to the east (beyond which is Deeside Industrial Park including Toyota Motor Manufacturing); UPM Shotton Paper Mill and Weighbridge Road to the west; and the Flintshire Bridge 400kV Converter Station to the south.

1.3 Sensitive Receptors

The nearest residential properties are located within Connah's Quay, approximately 1.8 km to the southwest. The River Dee Estuary, designated as a Ramsar site, SAC, SPA and SSSI, is located approximately 1.6 km to the west. Shotton Lagoons and Reeds SSSI is located 773 m west from the site boundary. The site is set within a heavily industrialised area predominantly occupied by manufacturing and waste management industries.

1.4 COMAH Status

A COMAH Status Review (EnviroSolution Ltd, February 2025) has determined that the facility is classified as a Lower Tier COMAH Establishment under the Control of Major Accident Hazards Regulations 2015. This is due to the quantities of methane (12.9 tonnes from 33,880 m³ total biogas volume at 58% concentration) and propane (10.1 tonnes from 5 x 4.8 m³ storage vessels at 85% operating capacity) present on site, classified as P2 Flammable Gases under Schedule 1, Part 1 of the COMAH Regulations.

2. Process Description

The facility operates as a food waste anaerobic digestion plant with biogas upgrading to biomethane for grid injection. The process comprises the following principal stages:

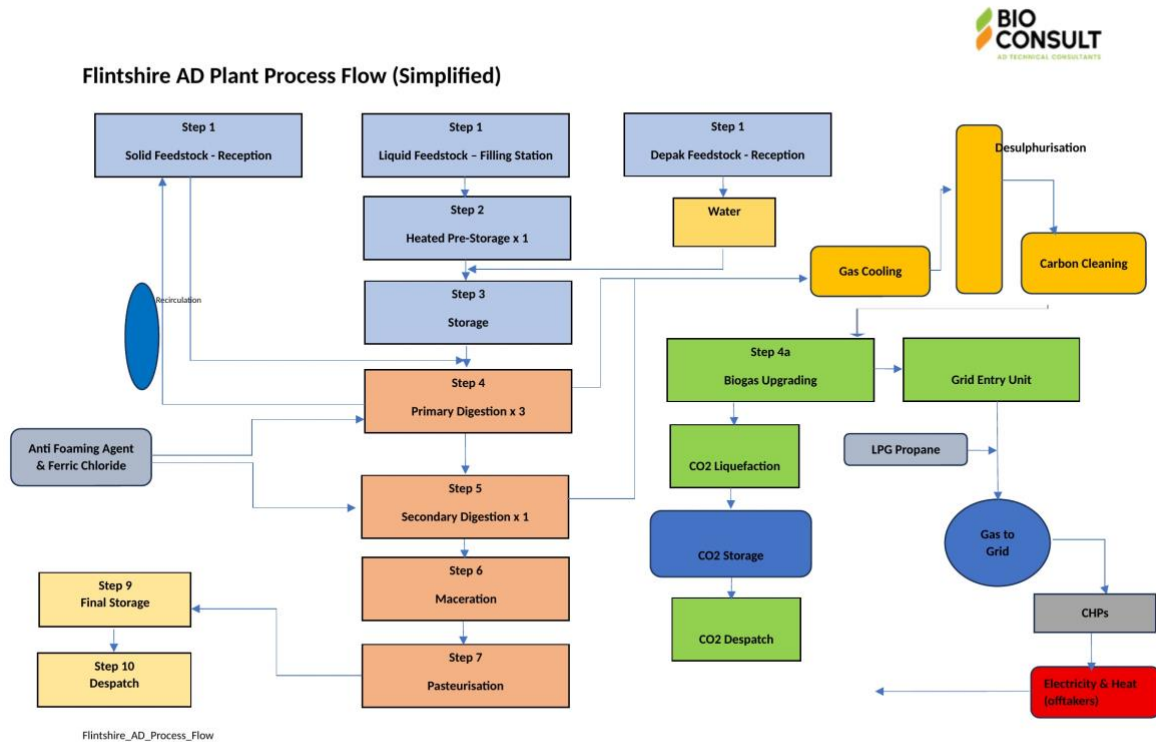


Figure 1: Flintshire AD Plant Process Flow (Simplified). The diagram is a simplified schematic representation of the principal process stages. For clarity, the two heated pre-storage tanks are shown as a single functional unit; full tank configuration and capacities are described in Section 3.2. Process steps for digestate separation and minor ancillary streams are not shown.

2.1 Waste Reception and Depacking

All waste deliveries, treatment and initial storage take place within the enclosed waste reception building (approximately 51.2 m x 38.0 m). The building is constructed with concrete surfacing and a sealed internal drainage system. The internal drainage from the building is collected in the mixing pit and recirculated within the process.

The reception building operates under negative pressure with a minimum of 4 air changes per hour. Fast-shutting roller shutter doors are closed during vehicle offloading to contain odours and dust. The building features compartmentalised areas for different delivery types.

Incoming packaged waste is processed through the BioConstruct/Huning depacking system comprising:

- Pusher plate container (Huning SBCK) with hydraulic cover
- Three disintegration rollers for breaking open packaging
- Separating crusher (Huning HTZ-3-1120) to separate organic material from packaging
- Inclined and discharge screw conveyors for material transfer
- Troughed belt and magnetic conveyor for ferrous metal removal
- Hammermill (Huning Optimatic) for further size reduction

- Feeding system (Huning SFC) delivering substrate to the AD process

Packaging waste, ferrous metals and other contaminants are separated and removed for offsite disposal or recycling. The organic fraction is delivered to the buffer/pre-storage tanks and then to the digesters via the substrate distribution system, which includes central pumps (Wangen/Vogelsang), a RotaCut macerator (Vogelsang RCX-58G, ensuring particle size ≤ 12 mm), and a Börger Bioselect separator.

Pumpable liquid wastes are received at a dedicated liquid feedstock filling station located within the reception building. Liquid deliveries arrive by tanker and are transferred directly via a sealed coupling point into the heated pre-storage system, bypassing the depacking equipment. All liquid feedstock is subject to the same pre-acceptance procedures, document checks and waste acceptance criteria as solid feedstock, in accordance with the Feedstock Acceptance Procedure (BCNE-PROC-18). Internal drainage from liquid reception areas is collected and recirculated within the process via the mixing pit.

2.2 Anaerobic Digestion

The fermentation process takes place in a dual-step continuous-flow anaerobic process operating in the mesophilic temperature range (38–42°C). The site configuration comprises:

- 3 primary digester tanks (fermenters), each 5,213 m³ capacity (Wolf System concrete tanks, 30 m internal diameter, 8 m shell height)
- 1 post-fermenter (secondary digester), 5,213 m³ capacity
- 2 digestate storage tanks, each 8,040 m³ capacity (33 m internal diameter, 10 m shell height)
- 2 quarantine tanks, each 100 m³ net capacity (4 m internal diameter, 8.1 m wall height)
- 1 fire safety tank, 200 m³ net capacity (7.32 m edge length, 5.5 m height)
- 2 heated pre-storage tanks, each 613 m³ net capacity (10 m internal diameter, 8 m shell height)

The digesters are above-ground concrete tanks (Wolf System GmbH) situated on concrete bases and fitted with insulated cladding. All tanks are fitted with roof-mounted double-layer weatherproof and UV-resistant gas storage membranes (Baur Folien GmbH DMGS) in the headspace, providing a total biogas storage capacity of 3,358 m³ (approximately 2 hours of biogas production). Gas membranes normally operate at 50% capacity to provide buffer storage.

The average hydraulic retention time across the two digestion steps is 51 days. Each digester is fitted with:

- Paddle mixers and submersible mixers for substrate agitation
- Heating coils utilising hot water from the CHP heat recovery system
- Temperature probes at multiple levels within the tanks, continuously monitored via SCADA
- Pressure and level transmitters reporting to the SCADA system
- Under/over pressure relief valves (Baur Folien ÜUDS 150 V2)
- Foam sensors with anti-foaming agent dosing capability
- Oxygen addition points for biological H₂S control
- FeCl dosing system for chemical H₂S control
- Sample points for controlled substrate removal and analysis
- ATEX-rated viewing ports with lights

If high or low-level alarm conditions are reported to the central SCADA control system by in-vessel transmitters, the system responds automatically to return the process to normal operational range. An exceedance of pressure thresholds triggers SMS alarms and initiation of the emergency flare. All electrically operated monitoring equipment inside risk zones is ATEX rated.

2.3 Pasteurisation

Digestate is pumped from the post-fermenter to the pasteurisation system via a 12 mm macerator. The pasteurisation system consists of four 30 m³ tanks (Reiner Schmitt GmbH) mounted on a concrete base within an impermeable bund. Each tank is fitted with an insulating jacket, internal heating coil, ATEX-rated central mixer, and temperature probes at different levels. The pasteurisation sequence starts automatically once all probes reach 70°C or above, and the substrate is held at 70°C for a minimum of 1 hour to comply with PAS110 standards and Animal By-Products Regulations. Temperature probes are calibrated annually as agreed with APHA. There are no release points to air from these tanks.

2.4 Digestate Storage and Management

Following pasteurisation, digestate is pumped to the digestate storage tanks. Each is an 8,040 m³ circular concrete storage tank with a sealed gas storage membrane in the headspace. A 600 mm freeboard space is maintained (exceeding the SSAFO minimum of 300 mm). The tanks provide approximately 2 months' worth of digestate storage capacity.

Digestate may be separated using a Börger Bioselect RC150 HP separator to produce liquid and solid fractions. Separated liquid digestate is sent to final storage and removed as whole digestate by tanker via a coupling point inside the reception building. Separated solid digestate is stored in a sheeted trailer within the reception building until full, then covered upon despatch for removal from site.

The operator intends to apply the PAS110/ADQP quality standard to achieve end-of-waste status on quality digestate. Digestate that does not meet PAS110 criteria will be managed as waste under a mobile plant landspreading permit held by a third-party contractor. Contingency disposal routes at permitted treatment facilities have been identified for off-specification material.

2.5 CO₂ Recovery and Liquefaction System

The facility incorporates a CO₂ recovery and liquefaction system associated with the biogas upgrading process. This system captures carbon dioxide separated during biomethane upgrading and processes it into a liquefied product for off-site use.

A separate planning application for the CO₂ recovery and liquefaction system is currently under determination and is anticipated to be approved prior to commissioning.

The inclusion of this system within this Environmental Permit application ensures that all associated emissions and environmental impacts are fully assessed at this stage.

The CO₂ liquefaction system will not be commissioned or operated until all necessary planning permissions and regulatory approvals are in place.

The system operates as a closed, contained process and does not give rise to emissions to land or water. Emissions to air associated with the system, including process vent streams, have been assessed within the Air Quality Impact Assessment and are included within the site emissions inventory.

The CO₂ recovery system is physically and functionally integrated with the biogas upgrading plant and does not constitute a separate installation under the Environmental Permitting Regulations.

3. Biogas Treatment, Storage and Energy Recovery

3.1 Biogas Collection and Storage

All digesters, the post-fermenter, digestate storage tanks and pre-storage tanks are fitted with gas-tight collection membranes in the roof space, providing a total storage capacity of 3,358 m³. Each tank is equipped with gas pressure and gas level measurements and all tanks are interconnected via gas lines. Pressure equalises automatically through the gas lines.

Gas blowers are used to maintain pressure between the internal air space of gas membrane and weather membrane. Their role is simply to keep the outer membrane inflated and stable as gas pressures increase/decrease within the digester.

Biogas composition is monitored by an in-line gas analyser (UNION Instruments INCA4001) with sensors for H₂S, O₂ and CH₄, reporting to SCADA and undertaking sample analyses approximately every hour. Daily checks are also performed using a handheld gas monitor calibrated annually.

3.2 Biogas Treatment

Hydrogen sulphide is managed via a combination of:

- Biological control within the digester headspace: nets situated in the head of the digesters allow cultivation of sulphur-removing bacteria, with small amounts of oxygen injected to support microaerophilic bacteria that oxidise H₂S
- Chemical control via FeCl dosing from a dedicated bunded tank, controlled by gas analyser data
- Activated carbon filtration (Reiner Schmitt GmbH, 3 m³ capacity) for polishing prior to the upgrading unit. H₂S effectiveness checked daily; carbon replaced when chamber 1 reaches 180 ppm
- Ammonia washing unit (Helmut Breuer GmbH WFV-05/05) using sulfuric acid for removal of impurities as a first treatment step

Biogas is compressed within the gas compressor (Continental Industrie GB100) and cooled via gas cooling heat exchangers (APROVIS) with chiller units (Novatherm/Aermec) before entering the upgrading unit.

3.3 Biogas Upgrading

Biogas upgrading takes place in the DMT Environmental Technology Biogas Upgrading and CO₂ Liquefaction Plant. The biogas is compressed to approximately 12 barg and passed through a two-stage membrane system which strips methane from the CO₂. The resulting biomethane is then passed to the Grid Entry Unit for propanation (from 5 x 4-tonne AvantiGas LPG storage vessels providing approximately 39,000 liquid litres of propane) and odourisation prior to injection into the national gas grid.

Carbon dioxide is liquefied via the integrated DMT CO₂ liquefaction plant to food-grade liquid CO₂ (≥99.9% purity in accordance with EIGA 70/17), stored in four dedicated CO₂ storage tanks, and distributed off-site by tanker.

Biomethane that does not meet grid quality benchmarks goes to emergency flare (as per process flow). The DMT upgrading and liquefaction system incorporates inherent process vents including membrane off-gas, CO₂ condenser purge gas, and regeneration gas, all of which are discharged to atmosphere as integral design features of the plant in accordance with DMT's standard engineering specification.

3.4 CHP and Boiler

The site houses three CHP engines designed to operate on biomethane produced by the on-site biogas upgrading system. All biogas produced on site is directed to the upgrading system, with no direct combustion of raw biogas in CHP or boiler plant.

During initial operation, CHP 1 will utilise a proportion of the biomethane to meet on-site electrical and thermal demand. CHP 2 and CHP 3 will remain installed but non-operational until grid reinforcement works are completed in November 2027.

The majority of biomethane produced will be exported to the national gas grid via the Grid Entry Unit. Any biomethane not utilised on site will be exported to the grid, with flaring occurring only during emergency conditions, plant upset, or when gas cannot be processed or utilised safely.

Unit	Electrical (kW)	Thermal (kW)	Efficiency	Operating Hours
CHP 1 (MTU 16V4000 GS)	2,028	2,149	87.9%	8,760
CHP 2 (MTU 12V4000 GS)	1,521	1,608	87.9%	8,760
CHP 3 (MTU 12V4000 GS)	1,521	1,608	87.9%	8,760
Boiler (Viessmann Vitoplex 200)	–	1,100	–	Emergency only
Emergency Generator	200	–	–	Emergency only

The maximum permitted operating hours for the CHP units is 8,760 hours per year (continuous operation). A planned four-week proactive maintenance programme is undertaken annually on a rolling basis, reducing actual operating hours to approximately 8,060 hours per year. During scheduled maintenance downtime, standby power is provided via the private connection to the adjacent Toyota facility.

CHP exhaust emissions (dry, 5% O₂): NO_x <250 mg/Nm³, CO <1,300 mg/Nm³ (12V4000) / <1,000 mg/Nm³ (16V4000), HCHO <130 mg/Nm³. The CHP units are housed in insulated containerised units with gas detection systems triggering audible and visual alarms and automatic gas supply shutdown.

Heat from the CHP engine cooling water is recovered via a heat exchange system for heating of process tanks. Should the CHP stop producing power, the plant is supplied via a private connection to the adjacent Toyota facility. The emergency diesel generator provides backup power. The natural gas emergency boiler provides supplementary heat for process tanks when required.

3.5 Flare

The site is fitted with a Uniflare UF10-3000-BVF EA-compliant enclosed high-temperature flare stack for use only during safety situations or non-routine operating conditions (when gas consumers are unavailable). Key specifications:

- Design flow: 700–3,500 Nm³/hr biogas, 440–2,200 Nm³/hr biomethane
- Combustion temperature: >1,000°C with fully refractory-lined combustion chamber
- Minimum retention time: >0.3 seconds
- Design destruction efficiency: >99.7%
- Thermal rating: 20.94 MW with 5:1 turndown ratio
- Design emissions (normalised 0°C, 101.3 kPa, 3% O₂): CO 50 mg/Nm³, NO_x 150 mg/Nm³, TVOC 10 mg/Nm³, NMVOC 5 mg/Nm³
- PLC controlled with SCADA integration, flash-back protected flame arrestor, DSEAR and ATEX compliant

All flare use is recorded on the SCADA control system and documented within the EMS. Annual monitoring of flare emissions is undertaken if used for more than 10% of operational time.

4. Emissions Control and Abatement

4.1 Air Emissions

Point source emissions to air and associated monitoring points are outlined in the List of Emission Points document (Appendix 23 of the BAT submission). The potential air quality impacts from the CHP engines, flare, biogas boiler and upgrading unit have been assessed via dispersion modelling, which concluded that predicted concentrations of all pollutants were below the relevant Environmental Quality Standards at all locations of human exposure. Impacts at ecological sites were also predicted to be not significant. This includes emissions associated with the CO₂ recovery and liquefaction system described in Section 2.5, including process vent streams from the upgrading system, all of which have been assessed within the Air Quality Impact Assessment.

Gas consumers are subject to regular maintenance, monitoring and re-tuning. Annual MCERTS-accredited monitoring of CHP and boiler exhaust emissions will be carried out. Six-monthly performance monitoring of the odour abatement equipment will be undertaken in accordance with BAT 34 benchmark emission limit values.

The odour abatement system comprises a combination of engineered treatment stages designed to remove or reduce odorous compounds from extracted air. The system includes activated carbon deep-bed adsorbers, which capture odorous gases and VOCs through adsorption; wet scrubbers, which wash contaminated air with a recirculating liquid to absorb soluble pollutants; and biofilters, where microorganisms in a moist media bed biologically degrade odorous compounds. Many systems also incorporate pre-filtration (to remove dust or grease and protect downstream units), along with fans, ductwork, control instrumentation, and discharge stacks to manage airflow and ensure compliant emissions. Treated air is discharged via Emission Point A1.

4.2 Emissions to Water

There is one point source emission of water to surface water from the site: the controlled discharge of tested surface water from the containment bund, and from roadways and building downpipes.

Surface water accumulating in the bund drains to a collection sump pump chamber. A manual sample is taken and tested for water quality parameters in the on-site laboratory prior to release. If benchmark thresholds are met, the pump is manually operated to discharge to the site surface water drainage system, which flows to a lined attenuation pond outside the permitted area. Two shut-off valves are installed on the drainage system. All site drainage from yard areas, roadways and the bund sump passes through an oil interceptor prior to release.

Domestic sewage is discharged to the live foul sewer system by the railway boundary.

Internal drainage from the reception building is collected in the mixing pit and recirculated within the process. Condensate from gas lines is returned to the digesters via the condensate return system. The installation operates as a closed-loop system with no process effluent discharge, with all process liquids contained and recirculated within the anaerobic digestion process.

4.3 Fugitive Emissions

The Fugitive Emissions Plan (EnviroSolution Ltd) incorporates a source-pathway-receptor assessment and outlines infrastructure, maintenance and monitoring measures for controlling potential releases. This includes a Leak Detection and Repair (LDAR) programme prepared with reference to BS EN 15446:2008, with 6-monthly scheduled checks for gas leaks. Daily ambient gas level checks are performed using handheld monitors, supplemented by fixed gas detection in CHP containers and in-line gas analysers.

4.4 Containment

The main treatment, processing and storage infrastructure is contained within an impermeable concrete containment bund designed and constructed in accordance with CIRIA C736 – Containment Systems for the Prevention of Pollution. The bund provides a capacity of 9,408 m³, sized to accommodate 110% of the largest vessel volume (which exceeds 25% of total tankage volume). The bund walls are a minimum 2.5 m height including 250 mm freeboard.

The containment system comprises:

- Reinforced concrete retaining walls designed to withstand hydraulic load from catastrophic failure
- Impermeable concrete base slab with all tank bases constructed on top to maintain secondary containment
- Bentomat liner installed below the concrete layer for additional containment
- Radon Gas Barrier beneath the liner for management of ground gases
- All pipes, ducts and cables on cable trays and stanchions above the containment – no penetration of bund floor or walls
- Floodgate (MM Engineered Solutions stainless steel, 70-year design life) with watertight seal for intermittent vehicle access, operated under a documented procedure
- Bund sump with SCADA high-level alarm
- Firewater retention tank of 200 m³ capacity

5. Management

5.1 Environmental Management System

The facility will be operated by BioConstruct NewEnergy Ltd under a formal controlled Environmental Management System designed to ensure environmental risks and impacts are managed proactively, all legislative requirements are complied with, and procedures are in place for timely response to environmental incidents. The operator intends to implement ISO 14001 certification.

The EMS includes the following documented management plans:

- Odour Management Plan (in accordance with EA H4 guidance)
- Fugitive Emissions Plan (incorporating LDAR programme)
- Accident Prevention and Management Plan
- Noise Management Plan
- Process Monitoring Plan
- Pest Management Plan
- Fire Risk Assessment

The operator has conducted HAZOP and DSEAR assessments to inform infrastructure design and operational management. A site-specific Bioaerosol Risk Assessment has been prepared.

5.2 Competence and Staffing

The site staff team includes a full-time Site Manager, 2–4 full-time operatives, a technical engineer, and a team leader, supported by the BioConstruct on-call service team and specialist contractors (e.g. Uniflare for flare maintenance, 2G for CHP servicing, DMT for gas upgrading service and maintenance). An in-house Biologist qualified to degree level oversees sampling and process monitoring. A member of on-site staff will have NVQ Level 3 laboratory technician training. Technical competence will be provided via WAMITAB (MROC5) attendance or an equivalent Competence Management System.

5.3 Training

All staff receive training covering: regulatory context and permit compliance; environmental impacts of their role; reporting procedures for incidents and near misses; implementation of the Accident Management Plan; and process-specific operational training via the SCADA system. Contractor training needs are assessed and systems established to ensure adequate knowledge for on-site activities. Training records are maintained within the EMS.

5.4 Maintenance

A comprehensive 70-page Preliminary Maintenance Plan (BioConstruct GmbH, February 2025) covers all plant components with defined inspection and maintenance frequencies ranging from daily visual checks through to multi-year overhauls. The plan covers: biogas plant general maintenance, emergency power generator, depacking station (pusher plate containers, disintegration rollers, separating crusher, screw conveyors, hammermill), feeding system, substrate distribution (pumps, RotaCut, separator, pipes, valves), tanks (concrete, gas storage roofs, pressure valves, mixers, pasteurisation), compressed air systems, heating technology, gas technology (compressors, ammonia washing, gas cooling, activated carbon filters, gas flaps, compensators, condensate management), gas consumers (flare, CHP, boiler, gas upgrading), measurement technology (level, temperature, pressure, flow,

gas analysis, gas warning systems), iron chloride dosing, and exhaust air systems. Critical spares are held on site.

6. Monitoring

The operator has established a comprehensive monitoring regime comprising:

6.1 Process Monitoring

- Daily: pH, FOS:TAC ratio (on-site titration), visual digester inspection, biogas composition (handheld), odour checks at receptors
- Continuous (SCADA): temperature (multiple levels per tank), pressure, level, biogas flow, CH₄/CO₂/O₂/H₂S (in-line gas analyser), hydraulic and organic loading rates, mixer operation
- Twice monthly: VFA concentration, ammonium-N (NH₄-N), alkalinity – at UKAS accredited laboratory
- Quarterly (minimum): digestate VFA and ammonium-N
- Annually (minimum): tank sedimentation assessment, digester integrity checks (weekly exterior)

6.2 Emissions Monitoring

- Annual MCERTS-accredited monitoring of CHP engine and boiler exhaust emissions
- Six-monthly performance monitoring of odour abatement equipment per BAT 34 benchmarks
- Annual flare monitoring if used >10% of operational time
- Six-monthly LDAR programme for fugitive gas emissions
- Daily ambient gas level checks using calibrated handheld monitors
- Surface water quality testing before each controlled discharge from bund

6.3 Resource and Compliance Monitoring

- Ongoing monitoring of energy usage, water consumption and raw materials
- Pollution Emissions Inventory reporting
- Annual performance reporting to NRW
- Quarterly waste returns to NRW
- Ongoing monitoring and review of complaints, incidents and near misses
- Site Condition Report maintained throughout plant life

7. Impact Assessment

The operator has commissioned the following impact assessments:

- Air Quality Impact Assessment: Dispersion modelling of CHP, boiler and flare emissions concluded all predicted pollutant concentrations were below relevant EQS at all locations. Impacts classified as not significant at both human exposure and ecological receptor locations.
- Noise Impact Assessment (BS 4142:2014 and BS 8233:2014): Baseline monitoring October 2017 per BS 7445:1996. Noise modelling demonstrates 38 dBL_{A,r,T} achievable at nearest sensitive receptor. No adverse impact on residential amenity.
- Odour Impact Assessment (EA H4 methodology): Predicted odour concentrations below relevant benchmark levels at all sensitive residential locations. Potential odour emissions not considered significant.
- Flood Consequence Assessment: Majority of site defined as low overall flood risk. Mitigation measures and drainage strategy ensure acceptable flood risk levels.
- Bioaerosol Assessment: Given distance to nearest receptor, potential impacts unlikely to be significant. Concentrations expected to fall to background within 200 m.

8. Closure and Decommissioning

The plant is designed for an operational life of 25 years, considering inspection, maintenance and replacement schedules. A Site Condition Report has been prepared documenting baseline site characteristics prior to development. Changes and incidents impacting on site characteristics will be recorded throughout the plant's operational life.

The operator has prepared a Closure and Decommissioning Programme outlining measures for site closure including:

- Safe removal of all chemical and hazardous materials
- Adequate provision for drainage, vessel cleaning and dismantling of pipework
- Disassembly and containment procedures to minimise leakage, spillage, dust or hazard
- Soil sampling and testing of sensitive areas referenced against the initial Site Condition Report
- Methodology for removal/decommissioning to minimise noise, disturbance, dust and odour
- Protection of surface water and groundwater throughout the decommissioning process

Appendices

Appendix A – Design and Access Statement

Appendix B – Waste Recovery and Waste Codes

Appendix C – CHP Drawings

Appendix D – Flood Consequence and Conceptual Surface and Foul Water Management Plan

Appendix E – Storage of Waste Description

Appendix F – Environmental Risk Assessment

Appendix G – Environmental Statement: Drainage and Flood Risk

Appendix H – Propane Storage and Firewall Details

Appendix I – COMAH Information

Appendix N – Accident Management Plan

Appendix O – Pest Management Plan