2 Project Description

2.1 Introduction

The Applicant, Cycle0 (IE) Limited, proposes to develop a Renewable Biogas Facility (herein referred to as the Proposed Development) on a site located in the townland of Ballyvass, Castledermot, Co. Kildare.

This chapter will provide a detailed description of the Proposed Development and the key processes therein.

2.1.1 Description of the Proposed Development

The proposed development comprises the construction of an anaerobic digestion facility to produce renewable biomethane, CO_2 (which will be captured), and a bio-based fertiliser from organic material. The total gross floor area of the proposed development (including internal plant areas and ancillary structures) will be c. 6,007 sq.m.

The development will consist of the following:

- Construction of 2 no. primary digesters (with an overall height of c. 9.1m), a digestate storage tank (with a height of c. 11.3m), a pump house (with a gross floor area (GFA) of c. 362 sq.m), 2 no. post digester tanks (with an overall height of c. 9.1m), and a safety flare (c. 11.3m in height), located in the southeastern section of the site.
- Construction of 2 no. prepits (c. 4.3m in height), a pasteurisation buffer tank (c. 4.3m in height), and a pasteurisation unit (with a maximum height of c. 4.2m), located to the west of the primary digesters, within the southern section of the site.
- Construction of digestate treatment and feedstock reception building and odour abatement system (with a GFA of c. 2,797 sq.m and a height of c. 12.1m and c. 16.2m to top of odour abatement stack) located within the southwestern section of the site.
- Construction of roofed silage clamps (with a GFA of 2,424 sq.m and a height of c. 8.7m) and a fuel storage tank (c. 2m in height), located within the western section of the site.
- Construction of a combined heat and power (CHP) unit (with a GFA of c. 39 sq.m and a height of c. 2.6m and c. 5.6m to top of flue), a biogas boiler (c. 2.6m in height and c. 5.6m in height to top of flue), a backup boiler (c. 2.6m in height), located within the northern section of the site.
- Construction of a gas treatment unit (c. 4.2m in height), a grid injection unit (with a GFA of c. 22 sq.m and a height of c. 2.8m), and a CO_2 liquefactor (with an overall height of c. 10.7m to top of storage vessels) a propane tank compound accommodating 2 no. propane tanks (c. 1.6m in height), and an ESB substation (with a GFA of c. 24 sq.m and a height of c. 3.4m), located within the northern section of the site.
- Construction of a two storey ancillary administration building (with a GFA of c. 327 sq.m and a height of c. 11m) within the northern section of the site, adjacent to the site entrance.
- Alterations to the adjacent local road and site access road, including junction improvement and widening and site entrance and access arrangements.
- Associated and ancillary works including parking (9 no. standard, 2 no. EV and 1 no. accessible parking spaces, and bike storage for 10 no. bikes), site entrance and gate, a weighbridge, solar PV arrays at roof level, wastewater treatment equipment, bunding and surface treatments, boundary treatments, lighting, services, lightning protection masts, drainage, landscaping and tree planting, and all associated and ancillary works.

2.1.2 Site Location

General

The Proposed Development site (herein referred to as 'the site') is located in the townland of Ballyvass, approximately 3.3km northwest of Castledermot, Co. Kildare, 10km southeast of Athy, Co. Kildare and 12km northeast of Carlow town. The approximate grid reference location for the centre of the site is S 76846 88213, ITM: 676790, 688242.

An overview of the site location is provided in **Figure 2.1**.

Figure 2.1: Site Location

The total site area measures *ca*. 5.12 ha. The site is currently used for agricultural pastureland and bounded to the north and west by further agricultural pastureland. A quarry is to the south of the site. The M9 Motorway bounds the site to the east.

The site's northern and eastern boundary is flanked by an unnamed local road which gives access to farmland and a quarry to the south of the site. The local road (L8050) is ca. 30m north of the site and ca. 30m west of the M9 Motorway. An unmarked local access road runs along the proposed site boundary to the north and east. The Proposed Development will be accessed via this road and entrance will be established to the north of the site along this road. The eastern side of the site is directly adjacent to the M9 motorway, a prominent transport route that runs in a north-south direction and features a visible slip road or exit ramp.

Topography

The site is characterised as being flat to gently undulating. The site topography slopes gently from the northwestern boundary with a slight gradual gradient to the southern boundary. The northwestern boundary of the site is 82m OD, while the southwestern boundary is at 87m OD. The landscape in the immediate area surrounding the site has a gently undulating character, with slight variations in topography which is in keeping with the landscape character assessment of the site. There is a quarry to the south of the site and an increase in elevation at the Mullaghreelan Woods at 140m OD approximately 785m to the southwest.

The proposed approach road will be the existing unnamed road to the north of the site boundary. The existing road has a ground level of 82m OD at the junction of the L8050 Local Road and is generally flat as it continues east towards the M9 motorway.

Proximity to Designated Sites

The Proposed Development site is not within or immediately adjacent to any site that has been designated as a Special Area of Conservation (SAC) or a Special Protection Area (SPA) under the EU Habitats or EU Birds Directive.

The application site does not lie within nor is it immediately adjacent to any area that has been designated for nature conservation purposes. The closest waterbody to the site consists of the Ballynamony stream located 646 m to the east of the site. This stream runs northwest for approximately 2 kilometres until it joins the Greese River, a tributary of the Barrow River and River Barrow and Nore SAC which are protected by national legislation.

There are six European Designated sites within 15km of the Proposed Development, three of which are designated as Special Areas of Conservation (SACs), (Refer to **Chapter 5: Biodiversity**). These sites are illustrated in **Figure 2.2**.

An appraisal of the potential effects of the Proposed Development on the constitutive characteristics of European sites identified within 15km of the Proposed Development is set out in the Natura Impact Statement (NIS) (**Document Reference: 231239-ORS-XX-XX-RP-EN-13d-004**) which accompanies the planning application.

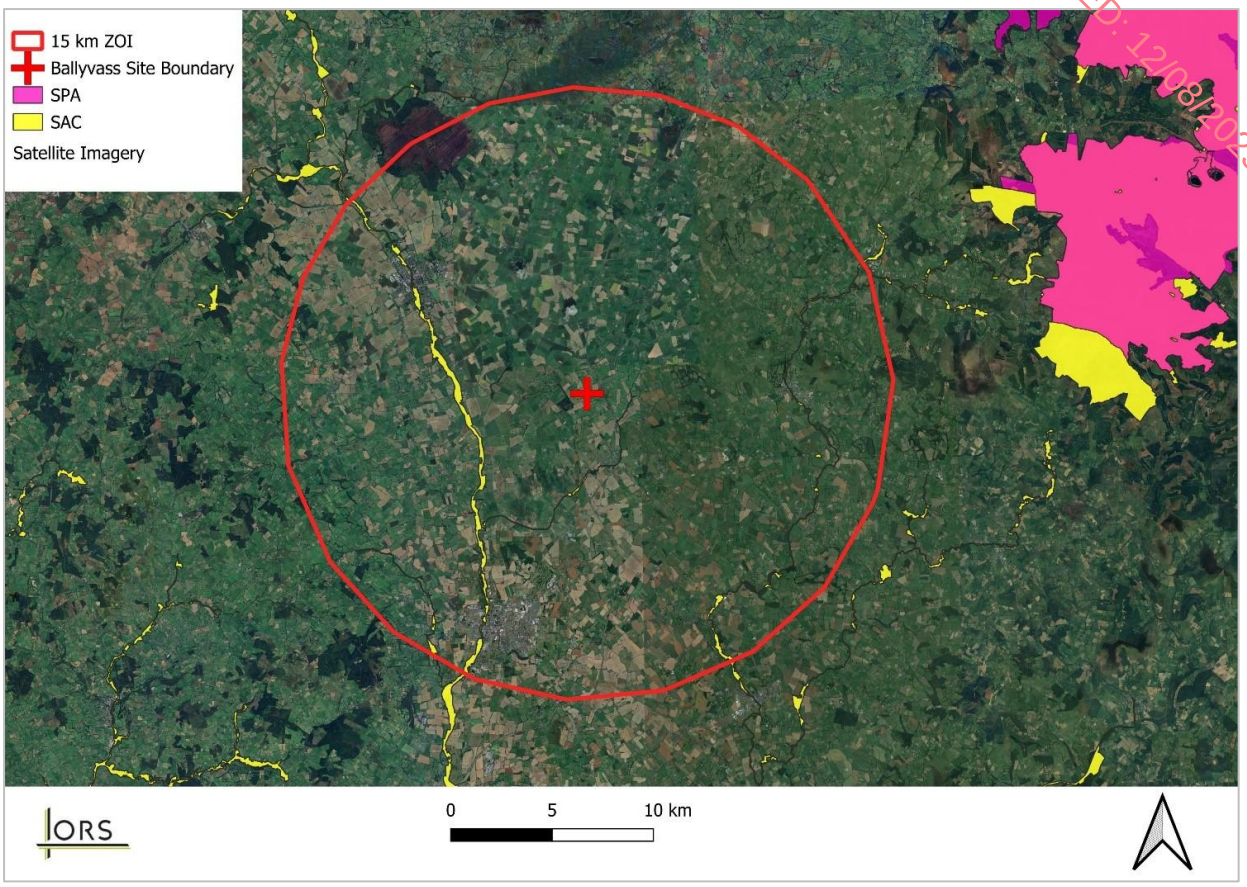

Figure 2.2: Map of Natura 2000 Sites within 15km of the Proposed Site

Habitat

No part of the site lies within nor is it immediately adjacent to any area that has been designated for nature conservation purposes. All proposed works within the site will take place in areas of low biodiversity value on a local level.

The site is in a rural area where the predominant land use is agriculture. The dominant habitat within the site is Improved Agricultural Grassland (Fossitt Code: GA1), which is regularly managed and of low ecological value due to its intensive past use and limited plant diversity. This grassland supports species typical of improved pastures, such as perennial ryegrass (*Lolium perenne*), white clover (*Trifolium repens*), and creeping buttercup (*Ranunculus repens*).

The site boundaries are enclosed primarily by Treelines (Fossitt Code: WL2) with species such as Ash (Fraxinus excelsior) and Sycamore (Acer pseudoplatanus) observed.

Surface Water

A drainage ditch (Fossitt Code: FW4 – Drainage Ditches) was identified running along the northwestern boundary of the site. This ditch flows in a northeasterly direction and acts as a receptor for surface water run-off from the site. The closest waterbody to the site consists of the Ballynamony stream located 646 m to the east of the site. This stream runs northwest for approximately 2 kilometres until it joins the Greese River, a tributary of the Barrow River and River Barrow and Nore SAC which are protected by national legislation.

2.1.3 Site Layout

The site layout is displayed in **Figure 2.3.** Detailed site layout and structural drawings are included in **Volume IV: Drawings**.

Figure 2.3: Proposed Site Layout Plan

2.1.4 3D Image of the Site Layout

A 3D model image of the site layout is included in **Figure 2.4**.

Figure 2.4: 3D Image of Site Layout

2.2 Process and Design Description

The key processes and design details illustrated in **Figures 2.3** and **2.4** above are described in detail in the following sections.

2.2.1 Summary Process Flow Diagram

A summary process flow diagram is presented in **Figure 2.5**.

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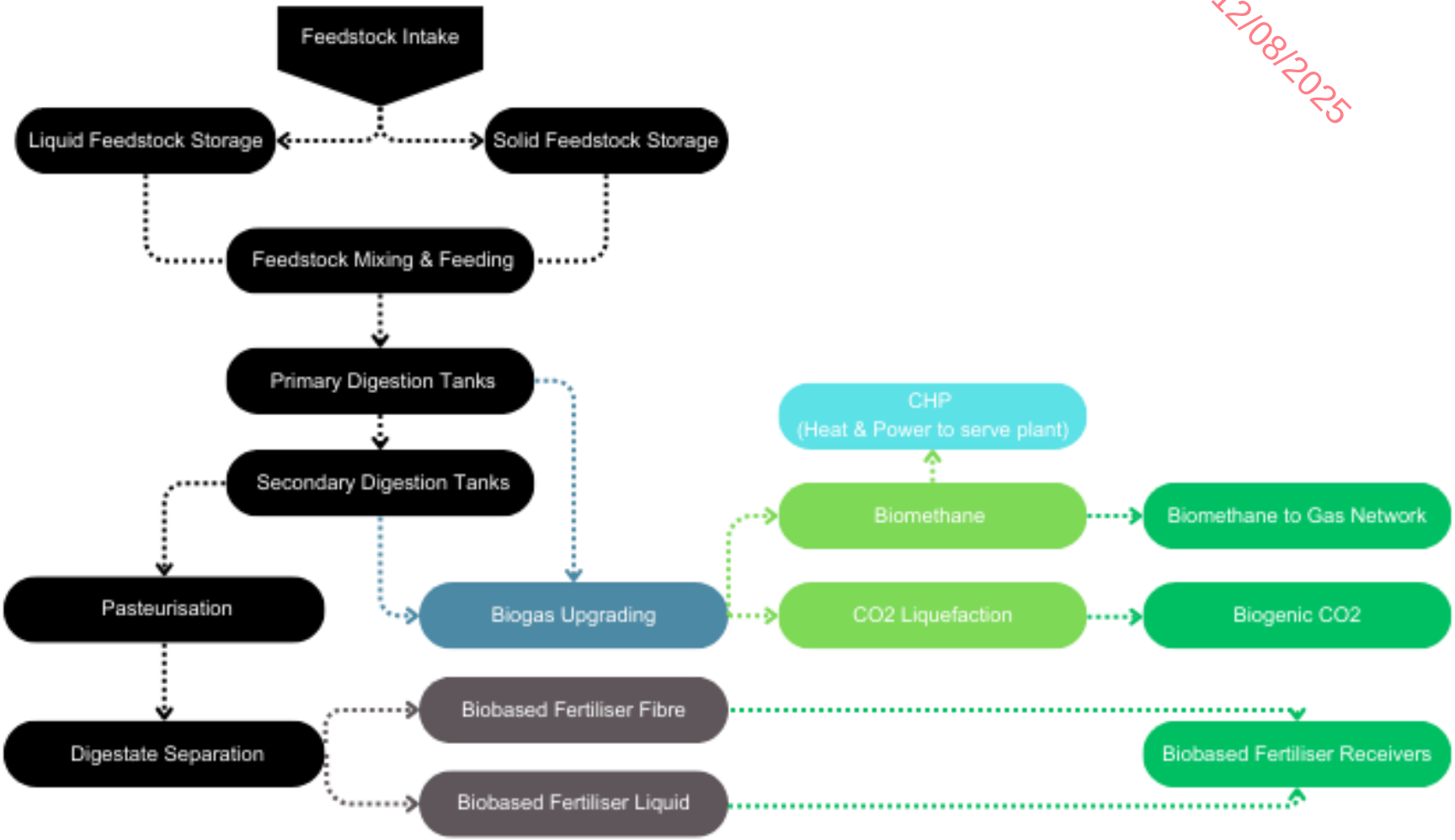


Figure 2.5: Process Flow

2.2.2 Plant Components

The plant components are listed in **Table 2.3** below. Detailed drawings showing design, layout and dimensions of components referenced are presented in the Planning Drawings that accompany this EIAR.

Table 2.3: Key Plant Components and Process

Drawing Ref.	Item	Details
01	Entrance Gate	Site entrance with 1.8-metre-high security gate.
02	Car Park	Staff and visitor parking, providing 9no. vehicle parking spaces. Including 2no. EV charging points parking spaces, 1no. disabled access parking space and bicycle storage.
03	Weighbridge	Weighbridge facility to record incoming feedstock delivery tonnages and outgoing biobased fertiliser tonnages.
04	Site Office	Site Office including Reception Entrance Area, Operational Room, Accessible Shower Room, WC, Welfare Facilities, IT Room and Storage on the Ground Floor. Offices, Meeting Room, Canteen and Laboratory on the First Floor.
05	ESB Substation	Substation to allow for import of back-up electricity when required. Including transformers used to transform incoming electricity from high to low voltage.
06	Roofed Silage Clamps	Silage storage clamp (61m x 40m x 8.7m) with roof, including roof mounted Solar PV array.
07	Fuel Tank	1,000 litre capacity self-bunded fuel storage for refuelling of site plant and machinery.
08	Digestate Treatment Building	Digestate Treatment Building will provide enclosed storage of pasteurised and separated solid digestate fibre. Digestate Fibre will be recovered during separation treatment.
09	Feedstock Reception Building & Odour Abatement System	Reception Hall accommodating solid waste reception, storage area and quarantine area. Maintained under negative pressure with adjoining Odour Treatment System. An Odour Treatment System to collect and treat all odours arising from potentially odorous activities occurring on site.
10	Pre Pit 01	Liquid feedstock intake and storage, prior to feeding.
11	Pre Pit 02	
12	Primary Digester 01	Primary Digesters are constructed using pour in-situ concrete, featuring walls measuring 6.3m in height and 28m in diameter. Each Primary Digester has a volume capacity of 4,950 m^3. Each Digester is equipped with a double membrane gas collection dome with a biogas storage capacity of 1,300Nm^3.
13	Primary Digester 02	
14	Pump House	Accommodation for pumping equipment and pipework for the transfer of liquid feedstock and digestate materials.

15	Post Digester 01	Secondary Digesters are constructed using pour in-situ concrete, featuring walls measuring 6.3m in height and 28m in diameter. Each secondary digester has a volume capacity of 4,950 m^3. Each Digester is equipped with a double membrane gas collection dome with a biogas storage capacity of 1,300 Nm^3.
16	Post Digester 02	
17	Digestate Storage Tank	Storage tank providing a storage capacity of 8,150m^3 for treated Liquid Digestate.
18	Pasteurisation Buffer Tank	Buffer tank providing storage capacity for Digestate prior to pasteurisation.
19	Pasteurisation Unit	Insulated pasteurisation tanks which will provide treatment of the digestate material to ABP standard.
20	CHP	2no. 250KWe capacity containerised CHP units and panel room. CHP utilising biomethane generated on site to produce heat for the digestion process.
21	Biogas Boiler	1no. containerised biomethane boiler, which will provide backup heat utilising biomethane generated on site.
22	Backup Boiler	1no. containerised biomethane boiler, which will provide emergency backup heat utilising biomethane generated on site.
23	Biogas Treatment System	Containerised biogas upgrading system to upgrade biogas to biomethane.
24	Safety Flare	1 no. enclosed gas flare serving as additional safety measure. Flare will only operate under distinct scenarios to ensure safety and compliance.
25	Grid Injection Unit	The Grid Injection Unit (GIU) comprises equipment which will ensure that the biomethane is compliant with all necessary standards and regulations before it enters the local gas network.
26	CO2 Liquefaction System	CO2 liquefaction system to recover CO2 from the biogas upgrading process.
27	Propane Tank Compound	Supply of propane to enhance CV of biomethane when necessary.
50	Landscaping	Landscaping and native tree planting scheme.
51	Concrete Apron	Yard area of concrete construction.
52	Bund Walls	The bund will be impermeable and provide the required storage volume i.e., a minimum of 110% of the largest single tank volume.
53	Bund Ramp	Ramp to bunded area to provide maintenance vehicle access.
54	Canteen & Toilet Wastewater Treatment	Wastewater treatment and percolation for wastewater from canteen and toilet facilities.
55	Palisade Fencing	1.8-metre-high palisade fencing surrounding the site.

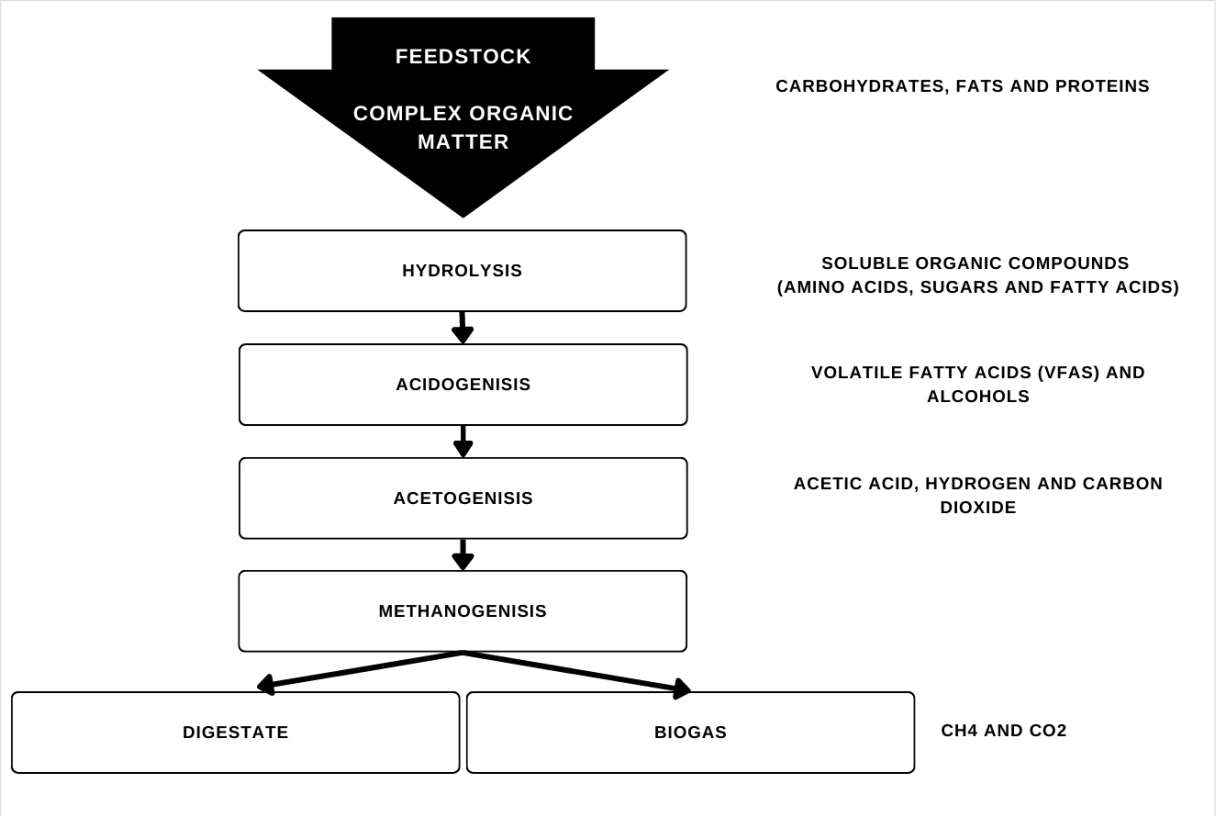
2.2.3 Anaerobic Digestion Process

Anaerobic Digestion (AD) is a natural biological decomposition process which takes place in an oxygen-free environment, where micro-organisms (bacteria and archaea) break down organic matter. There are four main stages to this process:

- Hydrolysis - large, complex polymers like carbohydrates, cellulose, proteins, and fats are broken down by hydrolytic enzymes into soluble monomers i.e., amino acids from proteins, long chain fatty acids from lipids, and simple sugars from complex carbohydrates.
- Acidogenesis – these soluble monomers are further broken down into short chain volatile fatty acids (VFAs), alcohols, carbon dioxide and hydrogen.
- Acetogenesis - the products of acidogenesis are broken down into acetate, releasing hydrogen and carbon dioxide.
- Methanogenesis – In this final stage of AD, various groups of methanogenic bacteria consume acetate, hydrogen and carbon dioxide and convert these intermediate products into CH4.

The biological decomposition stages are illustrated in **Figure 2.6**.

Figure 2.6: Biological decomposition process in AD



2.2.4 Biogas

Biogas is the product of this complex biological decomposition of organic materials, mainly consisting of 55-70% by volume methane (CH_4), 30-45% carbon dioxide (CO_2), together with traces of other gases, i.e., nitrogen (N_2), hydrogen (H_2), hydrogen sulphide (H_2S), ammonia

(NH_3), as well as water vapour. The exact composition of biogas is dependent on the type of feedstock being digested.

Biogas can be 'upgraded' to pure methane, often called biomethane, by removing CO_2, H_2S, moisture and other trace gases. The biogas upgrading process produces a purified stream of biomethane, which can then be injected into the main gas grid. The upgrading process also produces a CO_2 rich gas stream which can be recovered for treatment within a CO_2 liquefaction system to produce renewable liquefied CO_2.

Based on the feedstock composition and design operating capacity, it is projected that the facility will be capable of producing 510-580 Nm^3 of biomethane per hour.

2.2.5 Feedstock

The Proposed Development is designed to process up to 90,000 tonnes per annum of feedstock, primarily comprising locally sourced agricultural manures, slurries, food processing residues, and crop-based materials. **Table 2.4** below provides an indicative breakdown of feedstock types and estimated annual tonnages. These figures are subject to variation based on market conditions, seasonal availability, and feedstock quality. However, the total annual feedstock quantity will not exceed 90,000 tonnes.

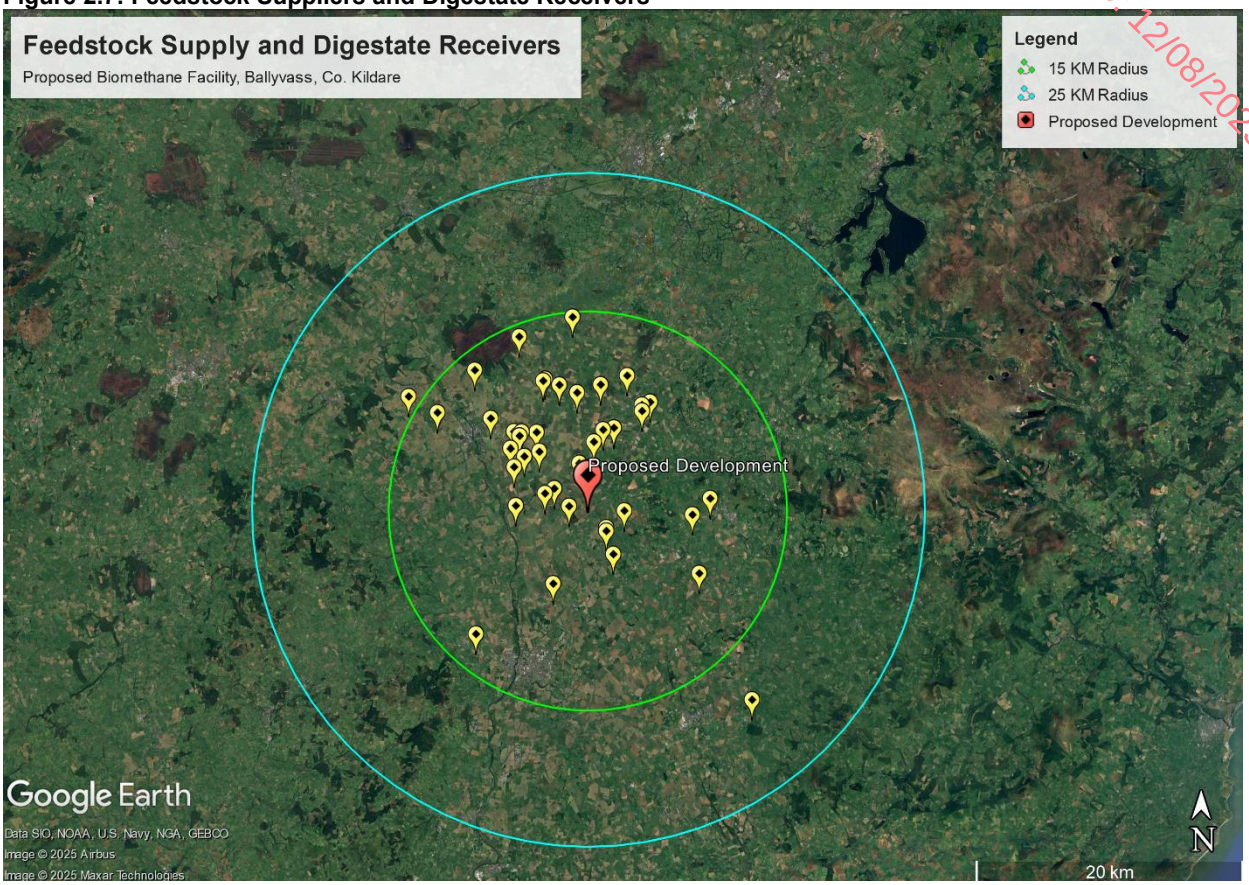
Table 2.4: Estimated Annual Feedstock Composition and Intake

Feedstock	Tonnes/Annum
Cattle Manure	5,000
Cattle Slurry	10,000
Dairy Production Residues	5,500
Drinks Production Residues	11,000
Food Production Residues	5,500
Grass Silage	20,000
Pig Slurry	18,000
Poultry Litter	10,000
Whole Crop Silage	5,000
Total	**90,000**

The agricultural manures, slurries, and crop-based feedstocks will be sourced from nearby agricultural operators. To date, the applicant has engaged with numerous local farmers, 46 of whom have confirmed their agreement to supply feedstock to the Proposed Development. In exchange, they will receive biobased fertiliser produced by the facility.

Figure 2.7 illustrates the geographical distribution of these feedstock suppliers and fertiliser recipients. Of the 46 confirmed sources, 96% (44) are located within a 15 km radius of the site, and all are within a 20 km radius.

Figure 2.7: Feedstock Suppliers and Digestate Receivers



2.2.6 Feedstock Acceptance and Storage Procedure

Feedstock will be transported to the Proposed Development using heavy goods vehicles (HGVs), enclosed trailers, and sealed vacuum tankers. Only feedstocks that meet strict acceptance criteria and comply with Environmental Protection Agency (EPA) and Department of Agriculture, Food and Marine (DAFM) licensing conditions will be accepted. All suppliers are required to complete a Feedstock Acceptance Agreement (FAA) and notify the weighbridge operator at least 24 hours before delivery.

Upon arrival, feedstock deliveries will be weighed and logged at the weighbridge located at the site entrance, in compliance with EPA and DAFM regulatory requirements. Hauler drivers will then proceed to the site office to review and submit the required commercial documentation for feedstock transport. A visual inspection of the feedstocks will also be conducted to ensure compliance with the FAA.

Once delivery and documentation are verified, vehicles will be directed to the Reception Hall for further processing.

2.2.7 Weighbridge

All vehicles delivering feedstock to or exporting digestate from the facility will use a weighbridge located at the site entrance, adjacent to the site office. The weighbridge data management system will automatically record all vehicle weights. Constructed from steel and mounted on

load cells, the weighbridge will be housed within a reinforced concrete pit chamber.

The weighbridge is shown as **item 03** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200**.

2.2.8 Feedstock Reception Building

The Feedstock Reception Building will be constructed with a steel frame, composite PVC-coated cladding, concrete flooring, and retaining walls equipped with rapid-closing doors. The building will include a ventilation and odour abatement system designed to maintain negative air pressure, minimising the release of fugitive odours. This integrated system comprising high-speed roller shutter doors, building ventilation, and odour abatement measures will effectively control fugitive emissions. All liquids and washings will be contained within the Reception Hall and returned to the process.

Upon arrival at the Reception Hall, drivers will reverse their vehicles into the building. High-speed roller shutter doors will open to allow entry and will promptly close before the discharge of materials.

Liquid feedstocks, such as slurries, will be discharged form within the Feedstock Reception Building into Pre-Pit 01 and Pre-Pit 02, each with a capacity of 150 m³. These pre-pit tanks will be constructed from concrete and located within a bunded area for additional containment. Solid feedstocks will be unloaded into three designated feedstock bays, which provide a total storage capacity of 750 tonnes - equivalent to five days of storage.

Before exiting the building, all vehicles will undergo external cleaning using a power hose. Once cleaned, rapid-closing doors will reopen to facilitate the vehicle's departure. The vehicle will then return to the office and weighbridge for re-weighing before exiting the site.

The Feedstock Reception Building is shown as **item 09** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200**.

2.2.9 Odour Treatment System

An Odour Treatment System will recover and treat all odours arising from potentially odorous activities occurring on site. All major odour sources, including the Feedstock Reception Building, Digestate Treatment Building, Pre-Pit 01, Pre-Pit 02 and Pasteurisation Tanks are connected to the Odour Treatment System. The odour treatment system is a proprietary system designed and supplied by a specialist contractor with extensive experience of treating odour from biogas and other organic waste facilities. In the event of a grant of licence by the EPA to carry out activities that require such a licence, it is expected that odour emission rates will be agreed as part of such a licence.

The Feedstock Reception Building has a volume of ca. 17,200m^3 and Digestate Treatment Building discussed below has a volume of ca 13,000 m^3. The ventilation and odour abatement system will be designed to achieve a minimum of two (2) air changes per hour which corresponds to a flowrate of 61,000 m^3/hour, providing adequate air changes in accordance with BAT.

Following a comprehensive review of BAT and odour abatement technologies, the applicant has adopted multi-stage treatment technology. This technology uses a combination of

Ammonia (NH_3) Scrubbing and Activated Carbon Filtration to achieve high levels of odour removal.

Ammonia (NH_3) Scrubbing

An NH_3 Scrubber is used for efficient NH_3 removal consisting of a reaction vessel with packing and liquid distributor and spray system. The exit route from the packed column includes a demister for removing entrained liquid droplets. Water conditioned with weak sulphuric acid is used as the scrubbing liquid, reacting with the ammonia to form ammonium sulphate.

Activated Carbon Filtration

Activated Carbon Filters act as a polishing step in the odour treatment process prior to discharge to the atmosphere via the stack.

The Odour Treatment System is shown as **item 09** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200**

2.2.10 Pre-Pit 01 and Pre-Pit 02

The Pre-Pit tanks will provide intake storage of liquid feedstocks prior to processing.

Pre-Pit 01 and Pre-Pit 02 are shown as **items 10 and 11** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200.**

2.2.11 Primary and Post Digestion

In a two-stage anaerobic digestion (AD) process, digestion occurs sequentially in primary digestion and post digestion tanks. This process will be facilitated by four Continuously Stirred Tank Reactor (CSTR) tanks:

- 2 Primary Digestion Tanks
- 2 Post Digestion Tanks

Primary Digestion Tanks

The Primary Digestion Tanks will be constructed using pour-in-situ reinforced concrete, with walls and bases designed to ensure durability and efficient operation. The reinforced concrete bases will slope towards a central point to optimise mixing. Each tank will have a capacity of 4,950 m³.

The tanks will be designed and constructed in compliance with *Eurocode 2 Part 2: Liquid Retaining Structures*, and their proper construction will be validated through a Construction Quality Assurance (CQA) plan.

Each Primary Digestion Tank will feature a double membrane gas collection system. This flexible, sealed twin-membrane structure will enable low-pressure gas capture and temporary storage, accommodating fluctuations in gas generation. The system consists of:

I. An inner membrane for temporary biogas storage.
II. An outer membrane containing low-pressure air maintained at slightly higher pressure to

ensure biogas flows to its destination (e.g., the Biogas Upgrade Unit).

The biogas storage capacity of each double membrane system is 1,300 Nm^3.

Primary Digestion Tanks are shown as **items 12 and 13** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200.**

Post Digestion Tank

The Post Digestion Tanks will be constructed using pour-in-situ reinforced concrete, with walls and bases designed for durability and efficient operation. The reinforced concrete bases will slope towards a central point to facilitate optimal mixing.

Each Post Digestion Tank will have a volume capacity of 4,950 m^3 and will be equipped with a double membrane gas collection system. This system will provide a biogas storage capacity of 1,300 Nm^3.

The Post Digestion Tanks are shown as **items 15** and **16** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200.**

Digestion Mixing

The Digestion Tanks will be fitted with mechanical mixers that use a series of paddles driven by externally mounted units. This configuration is designed to ensure thorough mixing and homogenization of the tank contents.

The mixers are sized based on the substrate's specific characteristics, including dry matter content and viscosity. This tailored approach ensures optimal mixing efficiency, aligning with the specific requirements of the digestion process.

Digestion Temperature

The temperature in both the primary and secondary digestion tanks is maintained within the mesophilic range of 37-42°C. Each tank is heated using integrated water heating pipework embedded in the tank walls. The Supervisory Control and Data Acquisition (SCADA) system monitors and controls the temperature, ensuring that the digesters consistently operate within this optimal range.

2.2.12 Pasteurisation System

The Pasteurisation System is designed to minimise the risks from microbiological hazards. The EU pasteurisation standard uses indicator organisms to;

- verify that pasteurisation achieves the required reductive effect on pathogens and,
- verify that no cross contamination between untreated ABP feedstock and digestate product occurs.

The EU pasteurisation standard requires that all the digestate material is simultaneously held at 70°C or above for a minimum of 60 continuous minutes. The use of this pasteurisation standard reduces pathogens to levels at which they do not pose a risk, ensuring that all digestate end products (Digestate Liquid and Fibre) are safe to handle and use.

In accordance with Animal By-product (ABP) Regulations all organic material must also be mechanically treated to ensure all particles are less than 12mm in size. This will be achieved through a screening and maceration pump prior to pasteurisation.

The Pasteurisation System will comprise the following items:

- 3 no. enclosed pasteurisation tanks
- Heat exchanger (with heat provided by the CHP/Biomethane Boiler)
- 1 no. maceration and screening pump (12mm)

Digestate from the Secondary Digestion Tank will be fed using enclosed pipework via the macerator and pump system to the 3 no. pasteurisation tanks. Pasteurisation will take place independent of the digestion system, in a batch process. By utilising 3 no. pasteurisation tanks in parallel it is possible to operate the pasteurisation system on a sequential batch basis with one tank filling, one processing and one emptying.

The digestate will be circulated by a pump system through a heat exchanger which will raise the temperature to greater than 70°C. The heating process will cease once the desired process temperature is achieved but material will continue to be maintained at temperature and agitated within the pasteurisation tank for a minimum of 60 minutes.

The pasteurisation tanks will each be equipped with 3no. temperature probes and ultrasonic level indicators to provide evidence to regulatory authorities that all material is kept above the minimum temperature (70°C) for the required minimum period of 60 minutes, therefore meeting the legal time and temperature standards.

The Pasteurisation System will be equipped with a datalogging system that will allow real-time thermographs to be produced via a SCADA system. The datalogging system and thermographs produced will be tamperproof.

The Pasteurisation System **(item 19)** is shown on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200**.

2.2.13 Digestate Treatment Building

The Digestate Treatment Building houses the Digestate Separation System. After pasteurisation, digestate is transferred via sealed pipework to the building for the separation process, which produces two outputs: solid digestate fibre and liquid digestate.

The building will be equipped with a ventilation system connected to the odour abatement system, designed to maintain negative air pressure. This integrated system, consisting of high-speed roller shutter doors, building ventilation, and odour abatement, will effectively control fugitive emissions. All liquids and washings within the Digestate Treatment Building will be contained and returned to the process.

The Digestate Separation System is designed to treat a minimum of 78,000 tonnes of whole digestate per annum. Following treatment, approximately 24,500 tonnes of digestate fibre and 53,500 tonnes of liquid digestate will be produced.

Screwpress Separation

The screwpress, comprising a rotating screw and mechanical screen, separates the digestate into a solid and liquid fraction. The solid fraction (solid digestate fibre) is passed through the separator and is collected in the enclosed storage bay below. The liquid fraction is the pumped to the Digestate Storage Tank.

The Digestate Treatment Building is shown as **item 08** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200.**

2.2.14 Digestate Storage

Digestate Liquid Storage

The site possesses a total storage capacity of 18,050m^3 (1no. Digestate Storage Tank and 1no. Post Digestion Tanks) for digestate liquid. It is projected that *ca*. 53,500m^3 of digestate liquid will be produced annually after complete digestate separation.

With onsite storage capacity amounting to 18,050m^3, there is sufficient storage to accommodate volume for up to 18 weeks at full production.

Digestate Fibre Storage

Solid digestate fibre will be housed in the dedicated Digestate Treatment Building. The building is vented to the Odour Treatment System which will recover and treat all odours arising from within.

The Digestate Storage Tank and Digestate Treatment Building are shown as **items 17** and **08** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200**.

2.2.15 Digestate Quality and Volume

The digestate produced will meet the quality and end-of-waste requirements of an agreed quality standard, such as Article 28 End of Waste, PAS110, or another standard approved by the regulator. It will also comply with the Department of Agriculture, Food and the Marine (DAFM) transformation parameters and testing requirements, as outlined in CN 11: Approval and Operation of Biogas Plants Transforming Animal By-Products and Derived Products in Ireland (DAFM, 2014).

Both digestate liquid and fibre will be classified as bio-based fertilisers, suitable for use on agricultural land as a replacement for chemical or mineral fertilisers. These products will primarily be returned to lands associated with feedstock supplies of crop and/or slurry, promoting a local circular bioeconomy. Digestate receivers will manage the storage and application of the bio-based fertiliser in accordance with S.I. No. 113 of 2022: European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022.

With an annual feedstock processing capacity of 90,000 tonnes, approximately 78,000 tonnes of whole digestate will be generated. Following treatment and separation, around 53,000 tonnes of liquid digestate (bio-based fertiliser) and 24,500 tonnes of solid digestate fibre will be produced.

At full capacity, the remaining liquid digestate will be treated in the Digestate Treatment Unit, producing 53,000 tonnes of nutrient-rich liquid digestate, which will be stored in the Digestate Storage Tank before being delivered to DAFM-registered end users.

Post-pasteurisation, the digestate will meet End of Waste requirements, such as Article 28 or PAS110, or other relevant standards.

2.2.16 Biomethane Boiler

The proposal includes 1No. 500kW containerised biomethane boiler, which will provide emergency backup heat when the CHP is unavailable. The boiler will utilise biomethane generated on site to produce heat for the digestion process.

The 1No. Biomethane Boiler is shown as **item 21** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200.**

2.2.17 Fuel Storage

1 no. 1,000 litre above ground fuel tank will be located within a bunded area on site and used for refueling on site plant and equipment.

This Fuel Storage is shown as **item 07** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200**.

2.2.18 CHP Units

The Proposed Development includes 2no. 250KWe capacity containerised CHP units. Biogas will be utilised to generate electricity to power the site parasitic load, and to supply heat for the primary and secondary digester tanks, pasteurisation, biogas upgrading and CO2 liquefaction processes.

The CHP units are shown as **item 20** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200**.

2.2.19 Biogas Upgrading

Biogas upgrading removes trace impurities in the biogas stream. The primary goal is to separate carbon dioxide (CO_2) from methane (CH_4) to produce renewable biomethane and CO_2. The proposed Biogas Upgrading Unit will recover over 99.9% of the biomethane present in untreated biogas by separating CO_2 from the biogas through the following process.

Initially, biogas is directed through a biological desulphurisation unit where specialised bacteria work to reduce the concentration of hydrogen sulphide present within the biogas. Following this step, the biogas is filtered through a series of activated carbon filters. This filtration process aims to eliminate any remaining hydrogen sulphide or trace volatile organic compounds (VOCs) generated during the breakdown of organic material in the anaerobic digestion process. Subsequently, the biogas proceeds through a biogas upgrading module, featuring a selective permeable membrane. Here, carbon dioxide passes through the membrane while methane gas is retained, resulting in an upgraded biogas known as biomethane. Notably, biomethane attains a molecular composition equivalent to natural gas.

The Biogas Upgrading Unit is shown as **item 23** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200**.

2.2.20 Grid Injection Unit

Biomethane will be supplied to the existing gas network via the onsite Grid Injection Unit (GIU) connecting the site to the existing medium pressure distribution gas pipeline located within the site boundary of the Proposed Development, at Ballyvass, Co. Kildare. The GIU will be owned and operated by Gas Networks Ireland.

The GIU comprises equipment which will ensure that the biomethane is compliant with all necessary standards and regulations before it enters the local gas network. The unit performs the following key tasks:

- Gas pressure reduction and control: so that the gas pressure is always correct to match the medium pressure gas network.
- Gas analysis for compliance monitoring: the gas is tested for contaminants
- Metering: the volume of gas needs to be measured and recorded
- Flow Weighted Average Calorific Value: the energy content of the gas being injected into the grid needs to be measured and recorded. The calorific value must match the value stipulated by the local gas distributor.
- Odourisation for safety: prior to injection into the grid.
- Propanation: Where there are any shortfalls in the calorific value of biomethane, propane can be added from the on-site propane storage to match the calorific value required.

The Grid Injection Unit (GIU) is shown as **item 25** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200**.

2.2.21 CO_2 Liquefaction

By extending the Biogas Upgrading Unit with a CO_2 Liquefaction system, the gaseous CO_2 that is produced during the biogas upgrading process can be captured and liquefied.

The CO_2 which passes through the membranes in the biogas upgrading unit is further treated using activated carbon filters. Residual compounds which may have passed through the membrane of the biogas upgrading unit are removed. The clean carbon dioxide is then cooled, compressed, and dried into liquid form. The liquid is then stored in the carbon dioxide storage tanks prior to being transported offsite.

By utilising this process, the biogenic CO_2 from biomethane production which would have been emitted to the atmosphere is now captured, purified, and reused, thereby creating a circular economy.

The CO_2 Liquefaction is shown as **item 26** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200.**

2.2.22 Biogas Flare

An enclosed biogas flare is proposed for installation on the site, serving as an additional safety measure. The flare will only operate under distinct scenarios to ensure safety and compliance.

The biogas flare serves as a safety device in case the biomethane upgrading unit requires unscheduled maintenance. This flare is activated only in the unlikely event of when there is no outlet (i.e. the biogas upgrading unit and CHP) available for the produced biogas.

The flare is controlled and operated by the Supervisory Control and Data Acquisition (SCADA) system. An enclosed flare, characterised by the concealed flame and quiet operation below 65dB, ensure discreet and efficient operation during use.

The Biogas Flare is shown as **item 24** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200.**

2.2.23 Supervisory Control and Data Acquisition system

A supervisory control and data acquisition (SCADA) system will be installed for ease of operation and monitoring of plant processes. This system comprises hardware and software components to monitor and control industrial processes within the site. SCADA will be used to monitor and control the anaerobic digestion process, biogas upgrade, grid injection and associated plant and emissions control devices.

2.2.24 Office

The Site includes a two-storey Office Building incorporating an office area, meeting room welfare facilities, storeroom, first aid facility, communications, and control room.

The Office is shown as **item 4** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200**.

2.2.25 Water Supply

The water requirements for the Proposed Development will be met as follows:

The Proposed Development has been designed to maximise the reuse of rainwater that falls on site. Rainwater runoff from the roof of the Feedstock Reception Building and Silage Clamp will be harvested in a Rainwater Storage Tank for use within the site, such as wash water.

Harvested rainwater will provide water supply for the Office, with reverse osmosis treatment and UV treatment to provide potable water to the Office and Welfare Facilities.

2.2.26 Surface Water Management

The proposed site will require the collection, attenuation and disposal of surface water accumulated during rainfall events.

In developing the surface water design for the site, a range of surface water collection and SuDS measures were reviewed. Measures which were deemed suitable in controlling the quality and quantity of water being discharged from the development include:

- Collection of excess roof rainwater and runoff from impermeable surfaces and attenuating this runoff prior to discharge to an outfall location
- The use of linear channels with sumps throughout the development.
- The implementation of a combined below ground (Pluvial Cube) and above ground attenuation (detention basin) solution.

- The use of petrol interceptors
- The use of rainwater harvesting tanks.

Please refer to Civil Engineering Planning Report Ref: **231239-ORS-XX-XX-RP-C-13a-001.**

2.2.27 Foul Water Management

The wastewater from the toilet and canteen will be treated using a proprietary system as recommended in the Suitability Assessment. The proposed development will have a maximum design population of 2 no persons for Hydraulic and 3 for organic loading as per EPA Wastewater Treatment Manuals for Small Communities, Business, Leisure Centres and Hotels

Testing and assessment have been carried out in accordance with the requirements of EPA Code of Practice Wastewater Treatment Manuals Treatment Systems for Single Houses (p.e.< 10).

The only foul flows proposed from the site are generated from the office unit will discharge to an inspection chamber adjacent to the building and then discharge to a proprietary water treatment system. From there, it will be transferred via pressurised pipe to a tertiary water treatment system/percolation area with 60m^2 of attenuation, provided to 350mm depth using clean 20mm graded stone.

Please refer to **Civil Engineering Planning Report Ref: 231239-ORS-XX-XX-RP-C-13a-001** for a site-specific assessment report, testing results, and specifications.

The location shown on Drawing Ref: **231240-ORS-Z0-00-DR-B-200** is indicative and may be subject to change upon detailed design of the system.

2.2.28 Bunding

The bund is designed in accordance with IPC Guidance on Storage and Transfer of Materials for Scheduled Activities (EPA, 2004). The digestion tank area will be bunded in its entirety to provide sufficient containment volume in the unlikely event of a leak at the facility.

The bund will be impermeable and provide the required storage volume i.e., a minimum of 110% of the largest single tank volume (110% of 8,150 m^3 = 8,965m^3). The bund has been designed to accommodate >8,965m^3 in the unlikely event of a failure of the storage tanks.

Maintenance vehicle access to the bund will be provided via 1no. ramp.

The Bunding is shown as **item 30** and **31** on Drawing Ref. **231239-ORS-Z1-ZZ-DR-B-200**.

2.2.29 Access Road

The site's northern and eastern boundary is flanked by an unnamed local road which gives access to the L8050and onwards via the M9 motorway. The Proposed Development will be accessed via the local road with a new access point developed on the northern boundary.

The Proposed Development includes improvements to the local road, inclusive of widening of the junction area to provide safe and efficient passing of vehicles. Road improvement works are depicted in Drawing Ref. **231239-ORS-ZZ-XX-DR-TII-004.**

2.2.30 Boundary Treatment

The site boundary will be enclosed by a mesh panel perimeter fencing system *ca*. 1.8m high with secured mesh panel entrance and exit. The landscape strategy offers short to long term buffering, sustainability and biodiversity at its core and is specifically adapted to assist in integrating the Proposed Development into its surrounds. The buffer planting aims to increase value for wildlife and is pollinator friendly. The primary objective being to buffer visual receptors of the Proposed Development.

The Perimeter Fencing as **item 55** on Drawing **Ref. 231239-ORS-Z1-ZZ-DR-B-200**.

Please refer to Landscape Plan (**Ref: 25/C0/ORS/BKPL/001Rev B**) which accompanies the application.

2.2.31 Electricity Substation

The Proposed Development will include an ESB Networks substation. The substation will be designed and constructed in accordance with published ESB standard details and subject to ESB certification. A transformer is incorporated in the substation area to convert imported high voltage electricity to low voltage for use on site.

Under normal operation the Proposed Development will be powered by the on-site CHP units and Solar PV, with power supply from the grid provided only as a backup.

The Electricity Substation is shown as **item 05** on Site Layout Drawing Ref. **231239-ORS-Z0-00-DR-B-200**.

2.2.32 Solar PV

Solar photovoltaic (PV) modules are included upon the roof structures of the Feedstock Reception Building, Digestate Treatment Building and Site Office.

2.2.33 Site Security

Entrance to the site will include a locked gate, controlled entrance barrier and CCTV monitoring system.

2.2.34 Operating Hours

The facility will operate 24 hours per day, 7 days a week, as Anaerobic Digestion is a continuous biological process. However, feedstock will only be accepted between the hours of 0700 and 1900 Monday to Friday, and 0700 to 1600 on Saturday. There will be no deliveries on Sunday and on Bank Holidays.

2.3 Licensing Requirements

2.3.1 Environmental Protection Agency (EPA)

The EPA were consulted during the design phase of the Proposed Development, to verify authorisation requirements under the Environmental Protection Agency Act 1992 (as amended) or the Waste Management Act 1996 (as amended).

Having regard to current law and practice, the Proposed Development will require an application for an Industrial Emissions (IE) licence to the EPA in accordance with Class 11.4 (b) of the First Schedule of the EPA Act 1992 as amended, outlined in **Table 2.5** below:

Table 2.5: Class 11.4 of First Schedule to the EPA Act 1992 as amended

11.4 (a) Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving one or more of the following activities (other than activities to which the Urban Wastewater Treatment Regulations 2001 (S.I. 254 of 2001) apply):

1. *biological treatment;*
2. *physico-chemical treatment;*
3. *pre-treatment of waste for incineration or co-incineration;*
4. *treatment of slags and ashes;*
5. *treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components.*

(b) Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one or more of the following activities, (other than activities to which the Urban Wastewater Treatment Regulations 2001 (S.I. No. 254 of 2001) apply):

1. *biological treatment;*
2. *pre-treatment of waste for incineration or co-incineration;*
3. *treatment of slags and ashes;*
4. *treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components.*

(c) Notwithstanding clause (b), when the only waste treatment activity carried out is anaerobic digestion, the capacity threshold for that activity shall be 100 tonnes per day.

In the event of a grant of licence by the EPA to carry out activities that require such licence, it is expected that the following will be regulated under such licence:

- Emission Limit Values for emissions to air and stormwater;
- Monitoring requirements for emissions;
- Resource use and energy efficiency;
- Waste management control documentation;
- Waste acceptance procedures and records;
- Storage and transfer of substances;
- Changes to operations and the physical fabric of the facility;
- Facility management including the requirement for an environmental management system (EMS);
- Accident prevention and emergency response including fire water retention; and,
- Operational controls.

An Environmental Management System (EMS) will be put in place for the facility, as will be required by the IE Licence. The operator shall develop the EMS in accordance with

ISO14001:2015, applying for accreditation when operational. This EMS will include but not be limited to the following:

- Measures to comply with the IE licence and other relevant environmental legislation;
- Waste Acceptance Procedures;
- Standard Operating Procedures;
- Measures to comply with the corporate sustainability goals (e.g., reducing water and energy consumption); and
- Accident prevention and emergency response procedures

2.3.2 Department of Agriculture, Food and Marine (DAFM)

The Anaerobic Digestion Facility will be a 'Type 1' plant under the European Union (Animal By-Products (ABP)) Regulations (S.I. No. 187 of 2014).

The facility will process Category 2 animal by-products, specifically farmyard manures i.e., cattle slurry, pig slurry and poultry manure. Approval will be required from the Department of Agriculture, Food, and the Marine (DAFM) in accordance with Article 24(a) of Regulation (EC) No. 1069/2010, for the acceptance and/or treatment of animal by-products.

DAFM were consulted during the design phase and the Proposed Development has been designed in accordance with DAFM guidance *CN11: Conditions for approval and operation of biogas plants transforming animal by-products and derived products in Ireland*. The application process for approval and operation of the proposed facility by the DAFM occurs in three stages as follows;

1. Application for approval in principle.
2. Application for conditional approval to operate which allows an operating period of three months to test and demonstrate ABP compliance. This stage commences following the construction and handover of the facility.
3. Full approval.

This application process will commence upon receipt of planning consent.

2.3.3 SEVESO III Directive / Control of Major Accident Hazards (COMAH) Regulations

The Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 (S. L No. 209 of 2015) transposes Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC ("the SEVESO III Directive").

The purpose of the COMAH Regulations is to lay down rules for the prevention of major accidents involving dangerous substances, and to seek to limit as far as possible the consequences for human health and the environment of such accidents when they occur, with the overall objective of providing a high level of protection in a consistent and effective manner.

The COMAH Regulations place an obligation on operators of establishments that store, handle, or process dangerous substances above certain thresholds to take all necessary measures to

prevent major accidents and to limit the consequences for human health and the environment. Under the Regulations, an establishment may qualify as upper tier or lower tier, depending on the inventory of dangerous substances; sites that store, handle or process dangerous substances below a certain threshold do not qualify as establishments under the Regulations.

SEVESO/COMAH Assessment of the Proposed Development

Methane, the primary combustible component of biogas, is classified as a P2 flammable gas under Regulation (EC) No. 1272/2008, which governs the classification, labelling, and packaging of substances and mixtures. Among the flammable substances discussed in this document—biomethane, propane, and diesel - all are classified as "named dangerous substances" under Part 2 of the Seveso Directive/COMAH, except for biogas (untreated biomethane).

According to Note 19 in Annex I of the Seveso III Directive, upgraded biogas (biomethane) falls under the same category as natural gas. As a result, it has qualifying quantities of 50 tonnes for lower-tier and 200 tonnes for upper-tier classification. Similarly, LPG/propane shares these thresholds, while diesel has significantly higher qualifying quantities - 2,500 tonnes for lower-tier and 25,000 tonnes for upper-tier classification.

Biogas is classified under Part 1 of the directive, within the “categories of dangerous substances,” specifically as a P2 flammable gas. Under COMAH regulations, P2 flammable gases have a threshold quantity of 10 tonnes before the lower-tier requirements apply. Applying the aggregate calculation method outlined in the Seveso III/COMAH Directive, the proposed facility, when operating at full capacity, will store less than ca. 7.57 tonnes of flammable gas, and therefore remains below the lower-tier threshold. Therefore, it does not qualify as a COMAH-regulated site