

EIAR FOR POWERSTOWN BIOENERGY

Volume 2 - Main body of the EIAR

Chapter 3 - Description of the Existing and Proposed Development

Prepared for:
Greengate Biogas 001 Ltd.



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Unit 6, Bagenalstown Industrial Park, Royal Oak Road,
Muine Bheag, Co. Carlow, R21 XW81, Ireland
T: +353 59 972 3800 | E: info@ftco.ie

CORK | DUBLIN | CARLOW

www.fehilytimoney.ie

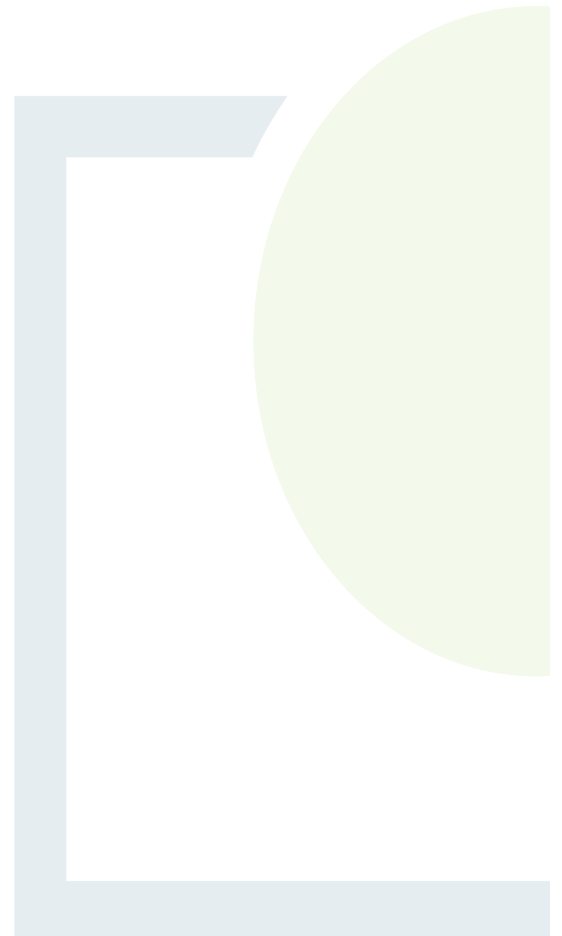


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3. DESCRIPTION OF THE EXISTING AND PROPOSED DEVELOPMENT

3.1 Introduction

This chapter includes a description of the existing quarry and the proposed development including proposed infrastructure, operations and construction. There is a glossary of terms in Chapter 1 of Volume 2 of this EIAR.

The existing and proposed layout drawings are included in Volume 4 of this EIAR, the first in the set is a Drawing Index Sheet which lists all drawing numbers and names.

The proposed development is located in the townland of Powerstown, Co. Carlow. The EIAR also includes an assessment of the proposed gas pipeline route in the townlands of Powerstown, Orchard, Ballynaboley, Rathvinden, Glebe, Rathornan, Tomard Upper/Lower, Ballygowan, Ballinabranagh, Fonthill and Raheendoran.

The proposed development is outlined in red and the proposed gas pipeline is shown in blue in Figure 3-1.

This chapter was prepared by James O' Neill, Tanya Ruddy and Bernie Guinan.

James is a Chartered Engineer and a Technical Director with Fehily Timoney and Company with 17 years post qualification experience working on waste management and landfill related projects. James holds an MSc in Civil Engineering from Trinity College Dublin (2009) and a BEng (Hons) in Civil Engineering from University College Dublin (2008). James is a Chartered Member of the Institute of Engineers Ireland and a Chartered Waste Manager with the Chartered Institute of Wastes Management. James' primary experience relates to the resource and waste management sector, in particular waste infrastructure design including anaerobic digestion, environmental & operational management of waste processing facilities, landfill remediation and aftercare works, remediation of contaminated lands, leachate and landfill gas management and civic amenity site design. James was responsible for the preparation of the drawings in Volume 4 of this EIAR. He has experience in similar roles on other AD plants, renewable energy infrastructure and strategic infrastructure developments as listed in his CV.

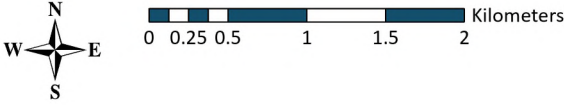
Tanya is a Chartered Scientist and holds a BA in Environmental Science and a MSc in Environmental Management. She is a Chartered Waste Manager (MCIWM). Tanya has 25 years post qualification experience in consultancy. She is experienced in project management of complex projects for both the public and private sector including the management and coordination of planning applications to An Coimisiún Pleanála and local planning authorities, licence applications to the EPA and waste facility permit applications to local authorities. Tanya is a Technical Director in the Circular Economy and Environment group in Fehily Timoney and Company.

Bernie Guinan is a Director of Fehily Timoney and Company and is responsible for the Circular Economy and Environment group. She has 25 years' experience in delivering and managing projects in environmental sector. Bernie has extensive experience in the preparation of Planning Applications, Environmental Impact Assessment Reports, Appropriate Assessments for a wide range of biowaste, waste management and biomethane infrastructure developments for Waste Contractors, Renewable Energy Contractors and Local Authorities. She has experience delivering expert testimony at Oral Hearings and Court Cases.

CVs are included in Appendix 1.1 of Volume 3 of this EIAR.



TITLE: Site Location Map	FIGURE NO: 3.1	
	CLIENT: Greengate Biogas	
PROJECT: Powerstown Biogas	SCALE: 1:48,000	REVISION: 0
	DATE: 11/12/2025	PAGE SIZE: A3





3.2 Existing Development

Drawing No. P24188-FT-XX-XX-DR-CE-0103 Existing Site Layout is in Volume 4 of this EIAR.

The site known as Mary Kelly's Pit is 9 hectares (ha) and is located at Powerstown, Milford, County Carlow, approximately 2.5 km north of Leighlinbridge, approximately 6 km north of Bagenalstown, approximately 2.5 km north-west of Nurney village, 8 km south of Carlow town centre and 15 km south-west of Tullow.

The site is located along the L3045, which is accessed from the Carlow to Kilkenny road - the R448 Regional Road. The site is located directly to the south of Carlow County Council's closed Powerstown Landfill site and to the west of the operational Recycling Centre, co-located on the landfill site both of which are under an EPA licence (Waste Licence no. W0025-04).

The site has been quarried by Kilcarrig Quarries Ltd. and has been partially restored¹. This site has perimeter fencing and has two access points off the L3045 road. The first entrance is c. 100 m from the R448 junction and was previously used as an access route into the quarry (the area which has now been restored). There is a property with associated out-buildings located adjacent to this entrance, within the boundary and ownership of the existing quarry. This will not be included within the proposed development boundary.

The second entrance is c400 m east of the R448 junction and is currently used as the main entrance to the site. This entrance is fenced and controlled by a gate; a wheel wash facility is located at the entrance.

The following features are near the site (measured as shortest distance from closest boundary(s)):

- M9 Motorway (Junction 6) 420 m north
- Powerstown Stream 200m north
- Railway Line (Dublin to Waterford) 320 m east
- River Barrow SAC Boundary 20m west
- River Barrow, 300m west
- 38 kV Powerline 2.5 km west
- Nearest Seveso Site c.7 km south²
- Powerstown Landfill (closed and restored) and Recycling Centre (operational) immediately north and east EPA Licence 20025-02
- GNI Cork Dublin gas distribution pipeline running south north c3km west
- Kilcarrig Quarries Ltd. Operational quarry 300 m south and accessed off Regional Road R448
- Dan Morrissey and Company operational quarry 1 km northeast accessed off Local Road L3050

The existing site is an operational quarry, and the majority of the quarry site (6.5 ha) has been partially restored by backfilling with soil and stone with the remaining area is being quarried for sand and gravel. An overview of the sites planning history and waste facility permit authorisation is presented in Section 3.2.1. An overview of existing operations is included in the following sub-sections.

¹ Planning Ref's.: 01/300 and PL01.129838 see Chapter 1

² Lower Tier: Royal Oak Distillery Ltd Clorusk Lower, Royal Oak, Bagenalstown, Co. Carlow



3.2.1 Planning History and Waste Authorisation

The planning history for the existing quarry is described in Chapter 1.

3.2.2 Site Topography

The sites topography is characteristic of its former use as a sand and gravel quarry which has been partially backfilled. The site is depressed with respect to the surrounding lands with steep slopes from the site up to the boundaries with adjacent lands. A landscaping berm exists beyond the western boundary of the site along the R448. The southern boundary slopes from the site upwards to the L3045. The internal site topography is characterized by irregular stockpiles or infilling to the eastern portion of the site associated with overburden from sand and gravel quarrying. The western portion of the site is generally more regular falling west to east to the lowest point of the site is located centrally along the northern boundary. Figure 3-2 to Figure 3-4 show views of the existing site.



Figure 3-2: View from southwest (restored area in fore and mid ground)



Figure 3-3: View from southeast (active quarrying in foreground)



Figure 3-4: View from south shows ongoing restoration of former quarry

3.2.3 Site Entrance and Access

The site is enclosed by a mixture of hedge lines, treelines and perimeter fencing and is accessed via two entrance points off the L3045, which connects to the R448 Regional Road. The western entrance, located approximately 100 metres from the R448 junction, was historically used for quarry operations and now serves a property with associated outbuildings situated within the existing quarry site boundary. This entrance is not used for current operational activities related to the quarry and soil recovery facility. It consists of a short block wall on either side of farm gates and a concrete apron on road side of the gates. The property is listed as a commercial property on the Eircode database. The eastern entrance, located approximately 300 metres east of the western entrance, is the primary operational access point. There is a concrete apron outside the gate and a short concrete roadway inside the gate. It is secured by wire mesh fencing and a farm gate and includes a wheel wash facility. There is CCTV.

3.2.4 Existing Site Infrastructure

There is one small concrete building on site which is not in use. It is single storey with no windows, one door and a flat roof. It was an electricity supply building, but it now disconnected.

There is one groundwater well which was installed by the landowner. Greengate Biogas 001 Ltd. installed 3 no. groundwater wells as part of site investigation works for the proposed development.

There is a small cluster of buildings, including a residence and outbuildings adjacent to the L3045 near the western access. It has an electricity supply. This is registered as a commercial property on the Eircode database. It is within the existing landownership of the quarry but is not included within the proposed development boundary. It will not be used as a residence during the operational phase. The applicant Greengate Biogas 001 Ltd. will take vacant possession of this property including all buildings upon approval of the application for development consent.

There is no other permanent infrastructure on the existing quarry.



3.2.5 Existing Quarry Operations

The operator uses the site to supply small property developers/builders with sand and gravel and accepts waste soils from these same developers/builders. The facility is operated on an ad hoc basis as materials are ordered or supplied to site. According to the operator, activity levels are low, the majority of sand and gravel is exhausted and soil import is imported based on local arisings c 1,000 tonnes per annum.

The existing topography is shown in the Drawings in Volume 4 of this EIAR.

The site is being gradually restored as per its planning consent (planning reference PL13/187). As can be seen from Figure 3-2 to Figure 3-4 the western portion of the site has been restored, and restoration is ongoing at the eastern end of the site. The existing planning boundary is shown on Drawing Number P24188-FT-XX-XX-DR-CE-0107 in Volume 4 of this EIAR along with the existing ownership boundary.

3.2.6 Existing Availability and Management of Feedstocks

3.2.6.1 Feedstock Availability

The proposed feedstock is agricultural residues including cattle and pig slurries, farmyard manures (e.g. cattle and horse) and poultry manure of which there is significant generation in Ireland. Table 3-1 shows the feedstock availability within 35 km of the proposed development. Refer to Chapter 2, Section 2.8.2 for further information.

Feedstock is divided into two main subcategories:

- Liquid Farmyard Manures (LFYMs)
 - cattle slurry
 - pig slurry
 - duck slurry
- Solid Farmyards Manures (SFYMs)
 - poultry manure
 - farmyard manures
- High Grade Farmyard manures (HFYM)

The Applicant has selected the feedstock mix as described in Section 3.4.3.

Table 3-1: Feedstock Availability within 35 km of the Proposed Development

County	Tonnes of Feedstock	No. Farms
Carlow	820,510	1,723
Kildare	303,653	634
Kilkenny	1,120,646	1,787
Laois	679,376	1,281
Wicklow	192,684	-
Wexford	528,162	866
Totals	3,645,031	6,382



3.2.6.2 Existing Management of the Proposed Feedstocks

Currently, animal manures, i.e. solid farmyard manures (SFYM) and liquid farmyard manures (LFYM) are spread to land in accordance with the Nitrates Regulations (See Section 2.6.2.1 of Chapter 2). Farmers collect and store SFYM and LFYM in the closed season (16-20 weeks) and spread in open season³. Intensive agricultural operators engage contractors to collect and store manures for spreading on contracted spreadlands⁴ in open season. Table 3-2 shows the existing tillage and pastoral areas available for land spreading within the catchment. It shows the total area of agricultural land within Carlow and surrounding counties. The table was generated using data from CSO and DAFM.

Table 3-2: Existing Agricultural Holdings

County	Tillage (ha)	Horticultural & Fruit (ha)	Grassland (ha)	Total farmed (ha)	Percentage of Land Area within 35 km	Land Area (ha) Available within 35km
Carlow	16,875	3,450	50,817	71,142	100%	67,692
Kildare	30,405	3,900	81,115	115,460	25%	27,880
Kilkenny	17,305	3,900	144,722	165,977	50%	81,014
Laois	16,920	3,150	103,104	123,174	40%	48,010
Wexford	47,936	9,750	117,693	183,651	20%	33,125
Total	129,441	24,150	497,451	659,404		257,721

3.2.6.3 Existing Management of Liquid Farmyard Manures: Cattle Slurry

Cattle slurry is a suspension of the liquid and solid faecal matter of cattle collected during indoor housing typically in the winter period as part of agricultural dairy and beef enterprises. Typically, cattle slurries from suckler, dairy and beef finishing enterprises are managed entirely on-farm. They are stored in slurry tanks on the farms where they are produced and spread onto the farm's lands during the slurry spreading season in accordance with the European Union (Good Agricultural Practice for Protection of Waters)(Amendment) Regulations 2026 - S.I. No. 119 of 2026 (Nitrates Regulations) and the farms' Nutrient Management Plan (NMP). Where the generating farm does not have capacity to spread all or some of the slurry arising it is exported to other farms and spread in accordance with the Nitrates Regulations and the receiving farms NMP.

³ The closed period for slurry spreading is a feature of the Nitrates Directive and the periods for Ireland are 1st October to January 12th /15th/31st depending on which part of the country a farm is located. For example, the closed season for Carlow is 1st October to January 12th but weather and soil conditions should be suitable for spreading after the closed season. Refer to Chapter 2, Section 2.6.2 for details on the Nitrates Regulations and Nutrient Management Plans (NMPs).

⁴ Spreadlands is a term used to describe lands on which manures and slurries are spread



3.2.6.4 Existing Management of Poultry/Duck Slurry

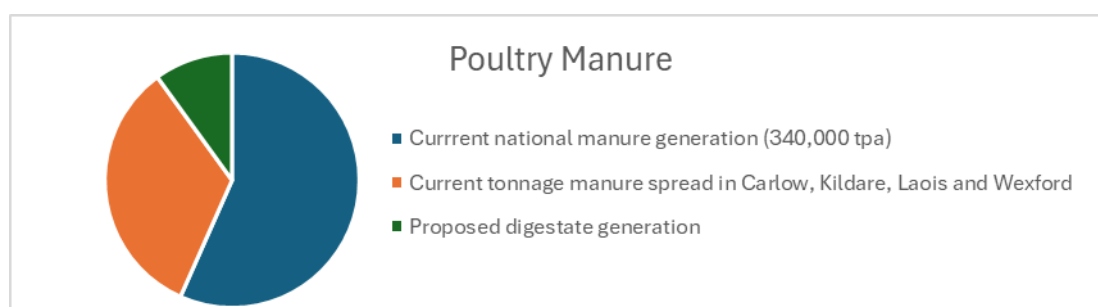
Duck slurry is a suspension of the liquid and solid faecal matter of ducks collected during year-round indoor housing associated with duck rearing enterprises. Poultry manure is a straw-based manure generated from broiler house bedding associated with the intensive rearing of poultry for meat production. Intensive poultry farmyards use limited bedding and therefore poultry manure is mainly faecal matter with limited straw content.

Poultry manure is rich in essential nutrients such as N, P and K, making it a highly potent fertiliser for tillage crops in Ireland⁵. The facilities that will supply this manure to the proposed development are geographically concentrated, in Limerick, Monaghan, and Cavan⁶. Duck slurry is generated in Monaghan and poultry manure in Monaghan, Limerick and Cavan. Agricultural land especially in the Cavan / Monaghan Region is not as suitable for land spreading these slurries and manures as tillage land in the southern Leinster Region due to their soil type, topography and existing soil nutrient loading. The poultry and duck units typically engage Aggregators to collect, store and transport manures from these areas to tillage farms for landspreading in the Eastern Region. 26% of all tillage farms in Ireland are located in Carlow, Kilkenny, Waterford, Kildare and Laois whereas the border counties have just 2% of all tillage farms (Central Statistics Office)⁷. Where an aggregator is engaged to deliver manures, they are spread by the receiving farmer in accordance with its NMP.

The operation of intensive agricultural activity (>40,000 bird places), e.g. poultry and duck units are regulated by an Industrial Emissions (IE) Licence issued by the EPA.

Licensees are bound to operate in accordance with the conditions and schedule of the IE licence. Typical licence conditions stipulate handling requirements and requirements for reporting of movements of organic fertiliser generated by the installation.

The existing movement of poultry manure from source to spreadlands is conditioned by the IE licence and typically managed by aggregators on behalf of the IE licence holder. The aggregator delivers the manures to the receiving spreadlands in accordance with Nutrient Management Plans and by the Nitrates Regulations. The receiving farmer spreads the manures to fertilise their lands. There are guidelines on Good Farming Practice: Spreading of Poultry Litter (Department of Agriculture). The chart shows the proportion of digestate generated from poultry manure to be managed in comparison to total poultry manure generation and the current quantity managed in Carlow, Kildare, Laois and Wexford. Data was compiled by the Applicant using CSO data and industry expertise.



⁵ <https://teagasc.ie/news--events/daily/broiler-litter-as-a-fertiliser-in-tillage-systems/>

⁶ As per the LOI's signed

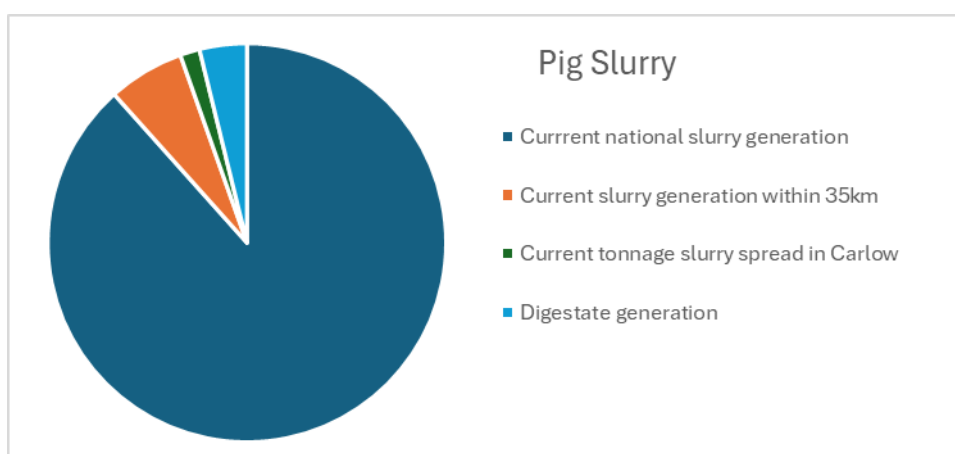
⁷ According to CSO Around 6 in 10 Specialist Tillage farms were in the South-East, Mid-East and Dublin regions. <https://www.cso.ie/en/releasesandpublications/ep/p-fss/farmstructuresurvey2023/farmstructure/>



3.2.6.5 Existing Management of Pig Slurry

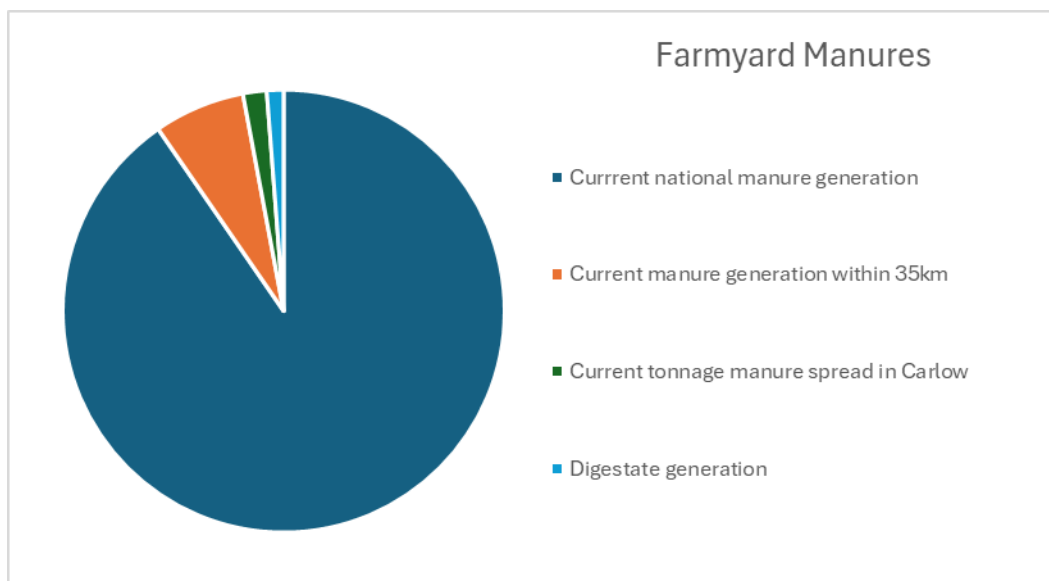
Pig slurry is a suspension of the liquid and solid faecal matter of pigs collected during year-round indoor housing associated with intensive pig rearing enterprises. These are concentrated in specific areas of the country e.g., northern, mid-west region and the south west region (Central Statistics Office, n.d.) and there are piggeries located within 35km of the proposed development. The pig farmers have access to their own landbanks which is an effective management strategy that involves a beneficial relationship with tillage farms. The pig farms provide their excess slurry to tillage farms in need of the fertilising benefits. The receiving farms benefit from a consistent supply of organic fertiliser for their soils. Piggeries often fall into intensive agriculture, requiring and IE licence in accordance with the First Schedule of the EPA Act 1992 as amended. Typical conditions in recent IE licences include requirements for handing and reporting of movement of organic fertilisers.

The existing movement of pig slurry from piggeries to spreadlands is conditioned by the IE licence, the receiving spreadlands' Nutrient Management Plan and by the Nitrates Regulations. The pie chart shows the proportion of pig slurry generated in Ireland compared to the proportion generated and managed in Carlow.



3.2.6.6 Existing Management of Farmyard Manure and High Grade Farmyard Manure

Farm Yard Manure (FYM) is straw based manure generated mainly from suckler cattle farms and beef finishing lots where animals are housed on straw-covered concrete floors during calving season or rearing of young animals and for over wintering. The straw bedding is periodically removed for fresh straw. FYM is therefore a mixture of urine wetted straw and solid faecal matter. High Grade Farmyard Manure (HGFYM) is from stabling of horses associated with the bloodstock and horse racing industries. The replacement of straw in racehorse stables is a daily event resulting in a manure with a high straw content and low faecal matter content. HGFYM has similar energy properties to fresh straw. Existing management of this feedstock is via landspreading in accordance with Nutrient Management Plans, either at farm of origin or on agricultural lands in need of fertiliser in compliance with the Nitrates Regulations.



3.2.7 Existing Utilities

There is a Gas Networks Ireland (GNI) transmission network pipeline (operating pressure 70 bar) in the vicinity of the existing site to the west of the M9 motorway running north south. There is an existing Above Ground Installation (AGI) at Clogrennane Lime Works with a 4 bar 100mm connection for the lime kiln. The location is shown in in Figure 3-1.

There are existing overhead electricity lines in the vicinity of the site with a 38 kV circuit running north south 3km east of the site.

There are no utilities on the existing site.

Utilities along the proposed pipeline route include electricity, telecommunications, water and foul water.

3.2.8 Existing Route of the Proposed Gas Pipeline

The proposed pipeline route is in the servitude of the existing road network:

- L3045 road for 100 m from proposed development to junction of R448
- R448 road travelling south from the site for c. 2 km to junction with L3038
- L3038 / L3039 road northwards for c. 4.5 km before turning westerly along Milford Park Road.
- along Milford Park Road for c. 1 km before turning north along the L3043 road for c. 900 m.
- c. 160 m on L7031 road turning into Clogrennane Lime Works to an existing AGI.

It is shown in Figure 3 2 and in the drawings in Volume 4 of this EIAR.



3.3 Proposed Development and Project

The public notice states:

In accordance with Section 37E of the Planning and Development Act 2000 (as amended), Greengate Biogas 001 Ltd. gives notice of its intention to make an application to An Coimisiún Pleanála (the 'Commission') for permission for development comprising the construction and operation of an anaerobic digestion facility at Powerstown, Milford, Co. Carlow.

The proposed development is covered by the provisions of the Renewable Energy Directive III (Directive 2023/2413) and the planning application is subject to a completeness check under section 37JA of the Planning and Development Act 2000 (as amended). The proposal is considered a 'Renewable Energy Development' under the definition introduced by S.I. 274 of 2025 into Section 2 of the Planning and Development Act 2000, as amended. When a notice issues in accordance with section 37JA(b), the provisions of Article 26A of the Planning and Development Regulations 2001 to 2025 shall apply.

The proposed development is an anaerobic digestion facility for the production of 250 GWh per annum of renewable natural gas and biogenic liquefied carbon dioxide from agricultural residues, including liquid farmyard manures and solid farmyard manures, collectively referred to as 'feedstocks'. The application seeks a planning permission that has a duration of 10 years from the date of grant. The proposed development will consist of the following:

- 2 no. site entrances off L3045, and a Weighbridge and Weighbridge Office (Gross Floor Area {GFA} 20 sqm, 3.85 m high).
- Circulation Yard (33,000 sqm) including: a Liquids Reception Building (GFA 735 sqm, 9.25 m high); a Solids Reception Building (GFA 2,386 sqm, 14.25 m high); a Solid Digestate Building (GFA 1,160 sqm, 12.85 m high); an Administration Building (GFA 459 sqm, 5.45 m high with a roof access area at 7.15 m high); a Heating Centre (GFA 1,314 sqm, 15.45 m high), with an exhaust stack (20 m high); 2,200 sqm of roof mounted solar panels on the Heating Centre, Administration Building, Liquids Reception Building and Solids Reception Building; and an Odour Abatement System including a stack (651 sqm, stack 35 m high).
- Bunded Tank Farm (19,075 sqm) including: 6 no. Primary Digesters (28.3 m high); 3 no. Secondary Digesters (28.3 m high); 1 no. Tertiary Digester (18 m high); 1 no. Post Digestion Liquid Digestate Storage Tank (21 m high); 1 no. Liquid Pre-Storage Tank (21 m high); 1 no. Digestate Storage Tank (17.6 m high); 3 no. Pasteurisation Tanks (11.9 m high); and Tank Farm Building (GFA 410 sqm, 5.5 m high).
- Gas Upgrade Area including: a Desulphurisation Plant (10.75 m high); a Gas Upgrade Plant (24.0 m high); a CO₂ Liquefaction plant (13.9 m high); a Biomethane Network Entry Facility (147 sqm, containers 2.975 m high, infrastructure 5.175 m high); and 2 no. Gas Flares Units (11.1 m stack height).
- Drainage Infrastructure and a Storm Water Lagoon (5,733 sqm).
- 1 no. Digestate Loading Tank (3.5 m high); 2 no. Buffer Storage Tanks (5.75 m high); and 2 no. Process and Fire Water Storage Tanks (4.6 m high).
- 2 no. ESB Substations (20 kV substation and a 38 kV substation).
- Ancillary Infrastructure including: Storage of Chemicals; Process and Fire Water Supply; Site Security; Lighting; Landscaping; and Car Parking (48 no. spaces).



An Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS) have been prepared in relation to the project and accompany the planning application. The proposed development comprises an activity requiring an Industrial Emissions licence from the Environmental Protection Agency. The proposed development will be classified as a Lower Tier Control of Major Accident Hazards (COMAH) establishment and therefore falls under the scope of S.I. No. 209 of 2015 Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances Regulations 2015).

The EIAR and NIS have been prepared in respect of the construction, operation and, decommissioning of the project, including a gas pipeline for which permission is not being sought. The gas pipeline route is 9.6 km from the anaerobic digestion facility (for which permission is being sought) to an existing Above Ground Installation at Clogrennanne Lime Works, in the townland of Raheendoran, Co. Carlow. The gas pipeline route traverses the following townlands: Powerstown, Orchard, Ballynaboley, Rathvinden, Glebe, Rathornan, Tomard Upper/Lower, Ballygowan, Ballinabranagh, Fonthill and Raheendoran, all of which are within Co. Carlow.

As stated in the public notice, in addition to the proposed development, the Project includes a gas pipeline which is outside the boundary for development consent (red line boundary). Gas Networks Ireland as the Statutory Undertaker will be responsible for obtaining development consent to construct and operate the proposed gas pipeline. The assessment of the gas pipeline route is included in this EIAR. The gas pipeline route as provided by GNI to Greengate Biogas 001 Ltd. is 9.6 km from the anaerobic digestion plant biomethane network entry facility (BNEF) to an existing AGI at Clogrennanne Lime Works, Co. Carlow.

The pipeline will be laid in the R448 road travelling south from the site for c. 2 km. The gas pipeline will then follow the L3038 / L3039 road northwards for c. 4.5 km before turning westerly along Milford Park Road.

The pipeline will travel along Milford Park Road for c. 1 km before turning north along the L3043 road for c. 900 m. The gas pipeline will connect to the Clogrennan AGI, located just off the L7031 road. It is shown in Figure 3-1 and in the drawings in Volume 4 of this EIAR.

An electricity supply is required to power the proposed development. The route or nature of the electricity supply has not been determined by ESB. Greengate Biogas 001 Ltd. submitted a grid connection application in May 2025. ESB will be responsible for obtaining development consent for the electricity supply as the Statutory Undertaker.

Each element of the proposed development is described in the following sections.

A detailed overview of the proposed feedstock menu is given in Section 3.4.3. The AD process will produce a raw biogas and digestate. The raw biogas generally consists of 50-75% methane and 25-50% carbon dioxide, along with smaller amounts of water vapor, hydrogen sulphide, and other trace gases. The raw biogas will be conditioned, desulphurised, separated into biomethane for injection into the local gas network as RNG and liquefied into biogenic CO₂ for export off site. This section describes the operation of the proposed development, the proposed feedstocks, the production of biogas and digestate and the proposed built infrastructure. A very simple flow chart of the process is shown in Figure 3-5 and a more detailed flow chart is included as Figure 3-6.

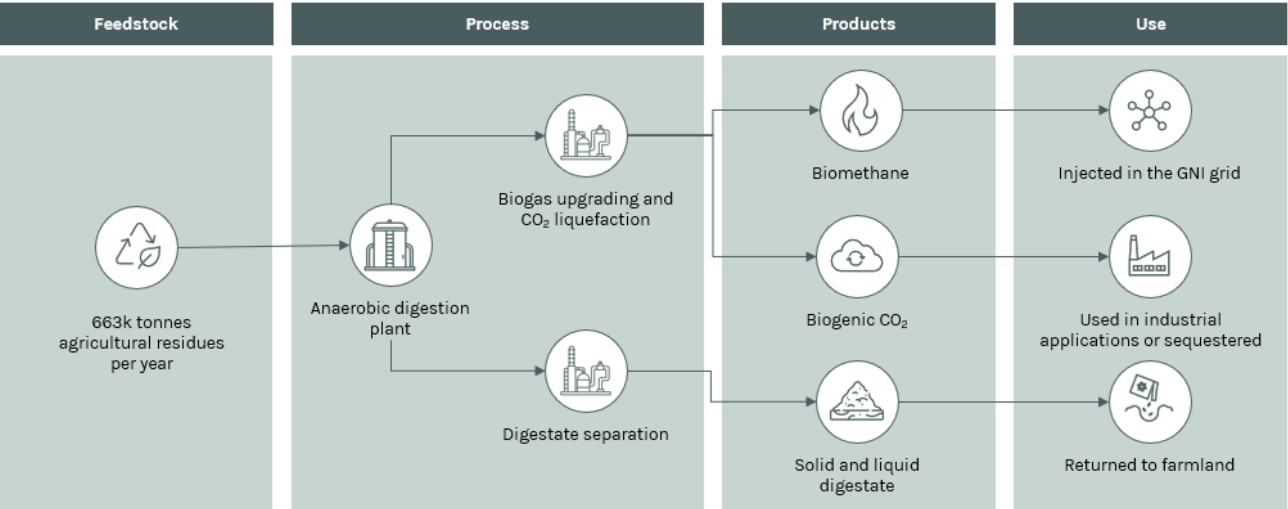
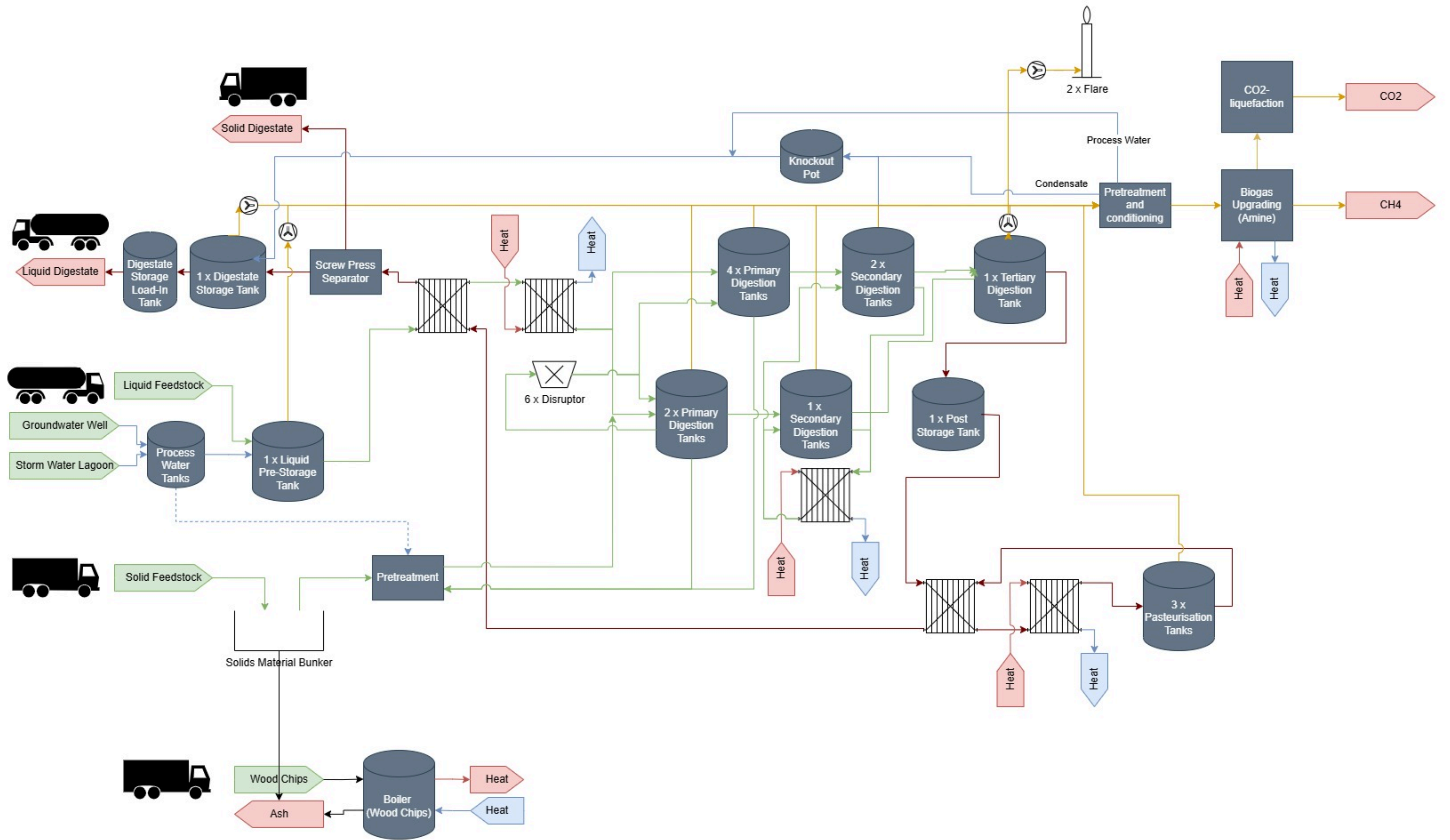


Figure 3-5: Anaerobic Digestion Simple Flow Chart



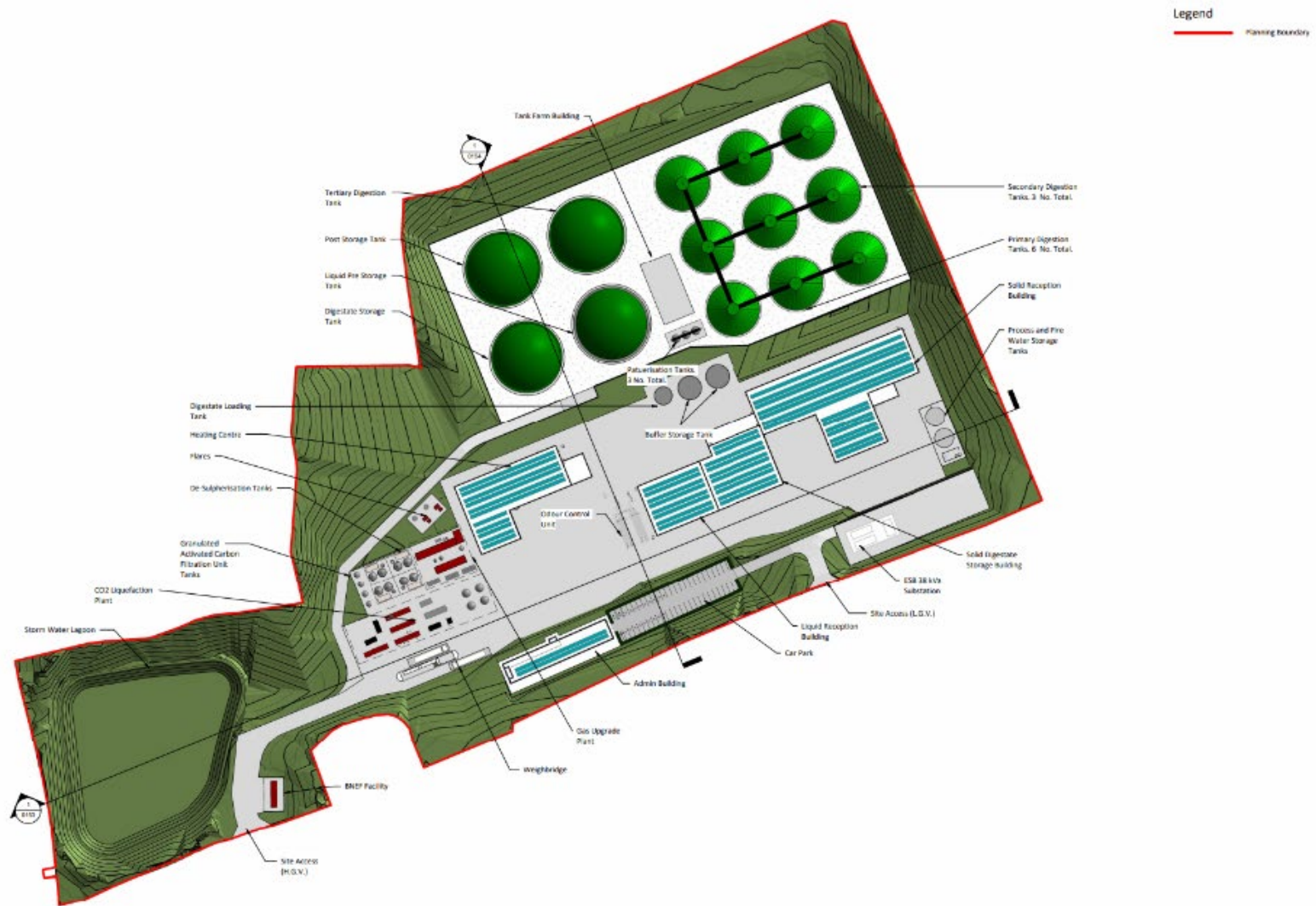


Figure 3-7: Proposed Site Layout

(See Drawing No. P24188-FT-XX-XX-DR-CE-0110 Proposed Site Layout Plan is in Volume 4 of this EIAR.)



3.3.1 Site Entrance and Access

The proposed Heavy Goods Vehicle (HGV) entrance is the existing western entrance. The second entrance to the east will be used only by cars and vans (LGV's) accessing the site. The proposed entrances which are accessed directly off local road L3045 which is in turn accessed off regional road R448. The local road L3045 junction onto the regional road R448 is <1 km from junction 6 of the M9 Dublin to Waterford motorway.

The proposed HGV entrance will be upgraded with a setback from the L3045, creating a dedicated internal stacking lane that allows HGVs to pull completely off the public road before reaching the security gates, ensuring the existing ghost junction to facilitate turning off the R446 remains unobstructed. The access point features wide turning radii and clear visibility splays to accommodate heavy articulated traffic safely. Security is maintained by 2.4m high powder-coated steel palisade fencing and automated gates, supplemented by a high-speed rising arm barrier for daytime traffic control. The proposed LGV entrance will be upgraded with new fencing and gates as at the HGV entrance. There will be an upgrade of road markings on the L3045 to clearly sign the site entry. The entrance itself will have high-visibility directional signage and lighting. Permission is sought to add appropriate advance warning signage for both accesses on the L3045. Examples of the signs are included in Section 6.8 of Chapter 6 Traffic and Transportation.

Drawing No. P24188-FT-XX-XX-DR-CE-0310 Proposed Plans and Elevations HGV Entrance and Drawing No. P24188-FT-XX-XX-DR-CE-1803 Site Entrance Sightlines are in Volume 4 of this EIAR.

The existing property consisting of cottages, sheds and outbuildings located on the site of the quarry is not included in the proposed planning boundary. Upon grant of planning, Greengate Biogas 001 Ltd. will take vacant possession of this property. Any future use of the property will be in compliance with the Guidance on technical land-use planning advice (HSA, 2023) and with planning legislation.

The proposed development does not introduce a new access onto the public road network. Rather, it makes use of two existing accesses, both of which have previously been accepted by the Planning Authority to serve the former quarry development, including HGV traffic associated with quarry operations. The current proposal retains the existing quarry access for future use by light vehicle access to the AD Plant and upgrades the former quarry access for HGVs, with both accesses providing the required visibility splays and operating sightlines. The receiving L3045 and its junction with R448 previously served the landfill and continue to serve the civic amenity site.

In these circumstances, it is considered that the principal road safety considerations associated with the haul route and access arrangements have already been established through the previous planning consent and the demonstrated operation of the accesses. The current proposal does not involve any fundamental change to the geometry of the public road or the manner in which traffic enters or exits the site. Accordingly, any road safety matters that might be identified through a Road Safety Audit are unlikely to be fundamental to the acceptability of the proposed development and would more likely relate to detailed design matters capable of being addressed through the detailed design process post decision.

It is also noted that the requirement for a Road Safety Audit was not identified during pre-planning engagement or subsequent consultation with Carlow County Council. Nevertheless, should the Planning Authority consider that a Road Safety Audit would be beneficial, the Applicant would have no objection to a condition requiring the completion of a Road Safety Audit and the implementation of any reasonable recommendations agreed with the Planning Authority at the detailed design stage prior to the commencement of development.



3.3.2 Weighbridge and Weighbridge Office

All vehicles entering the facility will enter via an at-grade automated weighbridge located on the southern boundary of the proposed development on the access road. The at-grade weighbridge will be of steel construction, mounted on load cells within a reinforced concrete pit chamber. A weighbridge office will be centrally located, elevated to be level with incoming HGV cabs to allow the operator to converse with all truck drivers. Access during operational hours will be controlled via traffic barriers.

The weighbridge office, centrally located between the weighbridges will be a cladded structure. It will contain furniture as required for the weighbridge operator, all electronic hardware necessary for operation of the weighbridge and appropriate storage for filing of paper-based records.

Drawing No. P24188-FT-XX-XX-DR-CE-1765 and 1766 Weighbridge Building Entrance Plans and Elevations and are in Volume 4 of this EIAR

3.3.3 Circulation Yard

All incoming solid and liquid feedstocks will be directed to the circulation yard. The circulation yard will be constructed using reinforced concrete to ensure durability, a drainage system is integrated in the design to manage storm water runoff, preventing pooling. The yard will have clear road markings and signage for safety and efficient traffic flow, alongside dedicated lighting to ensure safe operation during the hours of darkness.

3.3.4 Solids Reception Building

The solids reception building is for the reception of solid feedstocks. It is located at the eastern end of the site. The Solids Reception Building will be a portal frame building surrounded by a concrete circulation yard to facilitate access and egress of incoming and outgoing solid FYM delivery vehicles. The roof will accommodate solar panels.

There are five elements to the building:

- Solids Reception Hall
- Solids Material Bunker
- Solids Infeed Area
- Solids Pretreatment Shredding Area
- Electrical and Control Area

All areas of the solids reception building excluding the internally separated electrical and control area) will be connected via pipework to the odour abatement system (See Section 3.3.8).

Drawing No.s P24188-FT-XX-XX-DR-CE-1700-1703 Solids Reception Building (Plans, Elevations and Sections) are in Volume 4 of this EIAR

3.3.4.1 *Solids Reception Hall*

The solids reception hall will be constructed with a structural steel frame, reinforcement steel and insulated composite wall and roof panels with a concrete floor. The face of the building looking north has a 1 m section of translucent wall panel across the length of it to allow for sunlight to enter.

The hall will have 4 no. rapid entry roller doors and 4 no. internal roller shutter doors.



3.3.4.2 Solids Material Bunker

The solids material bunker will comprise a reinforced concrete bunker structure approximately 4m lower than the solids reception hall. The bunker will be internally compartmentalised from the reception hall by internal cladding and accessible by internal roller shutter door during the tipping of materials. The bunker will be capable of storing up to four days' worth of feedstocks to allow for continual automatic feeding of the plant during periods where feedstocks are not being accepted e.g. Sundays, Bank Holidays etc. Two overhead gantry cranes will be used to mix and stack incoming solid feedstocks in preparation for deposition to the solids pretreatment area.

3.3.4.3 Solids Pretreatment Area

The solids pretreatment area will be a standard steel structural frame, clad with insulated composite wall and roof panels on a concrete floor. Two identical pretreatment areas are proposed to either side of the solids materials bunker. Each pretreatment area will contain a shredder and two solids bio mixers. The installed gantry cranes will be able to feed each shredder. Access roller doors will be provided to each side of the solids biomixer areas for service and maintenance of the shredders, biomixers and gantry cranes.

3.3.4.4 Electrical and Control Area

The electrical and control area will be built using concrete walls, and a concrete floor. Access is provided through two entrances: one leading from the solid infeed area, and the other directly from the exterior of the building.

3.3.5 Liquids Reception Building

Liquid feedstocks will be delivered to site in sealed tankers to the liquid reception building. It is located central to the site. It will be constructed as a steel portal frame structure, with insulated cladding on the walls and roof. The north and east facades include a continuous translucent wall panelling to allow daylight in. There are 4 no. rapid entry roller doors on the side of the building looking south and another 4 no. rapid entry roller doors on the opposite side of the building looking north. There is an access single door on the side of the building looking south and another on the side of the building looking north. On the facade of the building looking east there are 2 no. access double doors and 1 no. access single door. The roof will accommodate solar panels. The liquids reception building has 4 no. lanes each separated by raised kerbing. Each lane contains:

- two spigot valve connection points, one to unload feedstocks and one to load digestate
- pump system to assist in loading of digestate
- pipework for the transfer of digestate or LFYM between the specialist liquid tankers and their respective storage tanks
- an odour abstraction hood in each lane, immediately above the tanker venting system to control point source emissions
- steel stairs and gangways to allow driver access about the tanker for cleaning operations

Within the liquids reception building there is a separate enclosed area with concrete walls and a hollowcore concrete roof. This enclosed area is divided into the following three sections:

- Laboratory and Sample store
- Mechanical room
- Electrical room



All areas of the liquids reception building excluding the internally separated electrical and control area) will be connected via pipework to the odour abatement system (See Section 3.3.8.) Drawing No.s P24188-FT-XX-XX-DR-CE-1715-1716 Liquid Reception Building (Plan and Section) are in Volume 4 of this EIAR

3.3.6 Solid Digestate Building

The Solid Digestate Building will be used for the separation of digestate into solid and liquid digestate following the anaerobic digestion process. Post separation all solids digestate will be stored and transferred offsite from within the solid digestate building. The facility is in an enclosed steel-frame building with insulated wall and roof panelling. Translucent wall panelling is included to allow daylight to enter.

The solid digestate building is divided in four main areas:

- Solid Digestate Loading Bay
- Solid Digestate Storage Area
- Separator Loft
- Mechanical and Electrical Area

All areas of the building excluding the mechanical and electrical area is connected via pipework to the odour abatement system . (See Section 3.3.8 and Section 3.4.4.) Drawing No.s P24188-FT-XX-XX-DR-CE-1710-1711 Solids Digestate Storage Building (Plans and Elevations) are in Volume 4 of this EIAR.

3.3.6.1 *Solid Digestate Loading Bay*

The solid digestate loading bay is within the solids digestate building. The digestate loading bay will be physically separated from the digestate storage area by a reinforced concrete stub wall to maintain physical separation. Hot power washing equipment will be located within the loading area for cleaning operations. A drainage system is installed in the floor to capture wash water runoff. This wash water is recycled back into the anaerobic digestion process.

3.3.6.2 *Solid Digestate Storage Area*

The solid digestate storage area will comprise a large open area of reinforced concrete floor. Reinforced concrete retaining walls approximately 5m in height will contain the stored solid digestate. A stub wall will provide separation between the digestate loading area described previously. A roller shutter door will provide access to loading area by a high-tip wheeled loading shovel used for loading operations. This wheeled loader will only be used for the loading of solid digestate. A conveyor arrangement suspended from the roof structure of the solid storage area will allow for solid digestate exiting the screw press dewatering system to be transferred about the entire floor plan of the solid digestate store. The conveyor system will be designed to allow solid digestate to be stored to an average height of 4m across the floor area. A total of approximately 4 days solid digestate storage will be provided to allow for continued operation of the digestate dewatering process during periods where solid digestates are not being transferred offsite e.g. Sundays, Bank Holidays etc.



3.3.6.3 Digestate Separation Loft

A loft space will be constructed to the rear of the Solid digestate storage area. The separator loft will contain the 4 no. screw press separators (See Figure 3-8 and Figure 3-9) used to dewater digestate into its solid and liquid fractions. The screw press separators will use a rotating screw to push the digestate material upwards through a cylindrical screen. As digestate is compressed against the screen the liquid fraction is filtered out, flowing downward with the solid fraction exiting at the end.

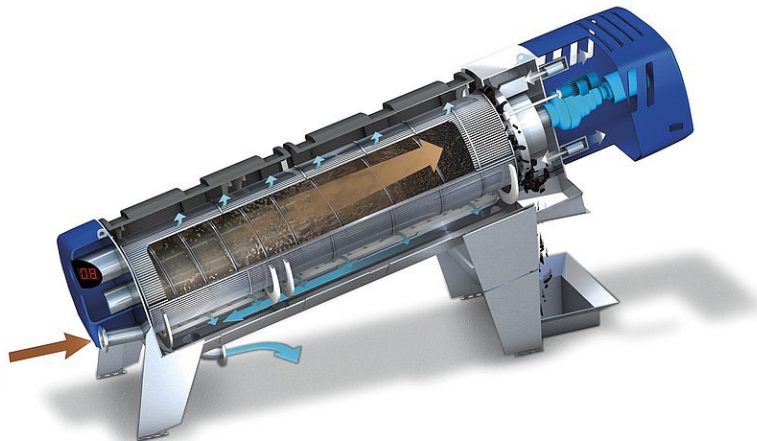


Figure 3-8: Screw press Separator Illustration (huber, 2025)

The liquid digestate will be transferred to the Post Digestion Liquid Digestate Storage Tank in the tank farm bunded area, awaiting collection for transfer offsite via the Liquids Reception Building (See Section 3.3.5). The solid digestate will drop downward through an open hatch in the loft to the automatic conveying system below (Figure 3-10). The conveyor system will automatically allow for stockpiling of solid digestate to the floor of the solid digestate storage area described previously.



Figure 3-9: Screw Press Separator Units



Figure 3-10: Solid Digestate Elevated Conveyor System

3.3.6.4 Mechanical and Electrical Area

The mechanical and electrical area will be constructed using reinforced concrete walls and has two access points from the outside. Internal stairs will access the digestate separation loft area. The main floor for the mechanical and electrical area is divided into three rooms: plant spares, small parts store and an electrical and control room.

3.3.7 Bunded Tank Farm

Drawing No. P24188-FT-XX-XX-DR-CE-1725-Tank Farm Layout is in Volume 4 of this EIAR.

The proposed bunded tank farm will comprise a large concrete bund area, lower locally to the surroundings fully encircled by a reinforced concrete wall. The bund will be access via a ramp that form part of the overall bund structure. The concrete bund will be designed and constructed in accordance with the requirements of

- EPA Guidance on the Storage and Transfer of Materials for Scheduled Activities (EPA, 2004)
- BS 8007 Code of practice for design of concrete structures for retaining aqueous liquids (BSI, 1987)
- CIRIA C736 Containment systems for the prevention of pollution (CIRIA, 2014)

The bunded area will be capable of retaining 110% of the largest tank volume or 25% of the total installed tank volumes (whichever is the greatest) with an appropriate freeboard depth. The bund will be subject to integrity testing prior to commissioning. The bund will provide impermeable secondary containment in the highly unlikely event of a tank failure or leakage.



The tank farm will comprise 16 no. tanks required for the anaerobic digestion process, these include 6 no. Primary digester tanks, 3 no. Secondary digester tanks and 1 no. Tertiary digester tanks. Additionally, there will be 1 no. Post Digestion Liquid Digestate Storage Tank, 1 no. post storage/digestion tank 1 no. Liquid Pre-Storage Tank and 3 no. Pasteurisation tanks located in the tank farm. A list of tanks is included in Table 3-3, and further detail is provided in the following sections. The buffer storage tanks (2 no.) and the digestate loading tank (1 no.) are located between the feedstock reception buildings and the tank farm.

The tanks are shown on the tank farm layout, tank farm details and elevations drawings (Drawing No's P24188-FT-XX-XX-DR-CE-1726-1730) are in Volume 4 of this EIAR.

Biogas will be collected from each digestion tank via gas piping. Sloping of the pipes and condensate wells will be installed at different areas of the plant as required. The condensate will be discharged to the liquid pre storage tank.

Table 3-3: Tank Farm Schedule

Tank	Number of Tanks	Internal Diameter (m)	Height (m)	Liquid Storage Volume (m3)
Primary Digester	6	23.9	28.3	10,408
Secondary Digester	3	23.9	28.3	10,408
Tertiary Digester	1	33	10* Note 1	7,356
Post Digestion Liquid Digestate Storage Tanks	1	35	9.6 * Note 4	12,026
Liquid Pre-Storage Tank	1	35	9.6 * Note 4	12,026
Pasteurisation Tank	3	4	10.7*note 5	135
Digestate Storage Tank	1	35	9.6 *Note 2	8,274
Buffer Storage Tanks ^{Note 3}	2	11	5.75	500
Digestate Loading Tank ^{Note 3}	1			150

Note 1 Tank Wall height; Total Height including Gas Balloon 18m

Note 2 Tank Wall height; Total Height including Gas Balloon 17.6m

Note 3 Tanks outside tank farm in dedicated bund

Note 4 Tank wall height; total height 21 m

Note 5 11.5m with gantry

3.3.7.1 Primary Digesters

There are 6 no. Primary digester tanks. Primary digesters will be constructed in steel. The steel digesters are constructed using coated (painted C2) steel plates for the liquid zone and stainless steel (AISI316) for the top gas zone (top ring and roof). The digesters will feature a reinforced concrete flat bottom. Insulation will be mounted on the outside tank and appropriately painted. The roof will be made of stainless steel, clad in insulation with a painted finish. There is a centrally located top mounted agitator on the tank's roof accessed by external stairs. The digester will be externally heated via an externally mounted heat exchanger to maintain the thermophilic process temperature range

3.3.7.2 Secondary Digesters

There are 3 no. secondary digester tanks. Secondary digestion tanks will be constructed identical to the Primary Digesters previously described.



A stair arrangement by a spiral staircase externally mounted to the primary and secondary digesters will allow access to the roof area and central stirrer motor. There will be a walkway between the tanks. The stairs and walkways will be constructed in hot galvanized steel according to relevant standards. There will be a minimum of two spiral access stairs to allow for separate access and egress points from the tank roof area. The digester will be externally heated via an externally mounted heat exchanger to maintain the thermophilic process temperature range

3.3.7.3 Tertiary Digesters

There is 1 no. tertiary digester tank. The tertiary digester tank will be constructed in concrete with a twin layered gas membrane domed roof. The tertiary digester will be externally heated via an externally mounted heat exchanger to maintain the thermophilic process temperature range. A twin layered gas membrane domed roof will be used to cover the tank. The concrete tank will be clad with insulation with a painted finish. Paddle mixers or submerged agitators will continually mix feedstocks within tertiary digestion tank.

3.3.7.4 Liquid Pre-Storage Tank

There is 1 no. tank with 4 no. days storage. The tank is constructed from reinforced concrete and is sealed to prevent odour emissions. It is located in the tank farm bunded area, connected via pipework. The tank will have several submerged mixers to keep particulate matter suspended in the slurry. The tanks are covered with a membrane gas cover and will connected to the gas system for collection of gas. These tanks will not be heated or insulated.

3.3.7.5 Post Digestion Liquid Digestate Storage Tank

Liquid digestate will be stored in a reinforced concrete tank with several submerged mixers to ensure that digestate can be mixed prior to pasteurisation. This is referred to as a Post Storage Tank on drawings in Volume 4 of this EIAR. A twin layered gas membrane domed roof will be used to cover the tank. The concrete tank will be clad with insulation with a painted finish. Paddle mixers or submerged agitators will continually mix feedstocks within post digestion liquid storage tank. The tank will be insulated to maintain digestate temperature pre-pasteurisation.

3.3.7.6 Pasteurisation Tanks

Digestate will be pastuerised in accordance with Animal By-Product Regulations (>70°C, >60mins) in three pasteurisation tanks. Pasteurisation tanks will be constructed in stainless steel and externally insulated. Pasteurisation tanks will be mixed by a centrally mounted vertical mixer. Each pasteurisation tank will be fitted with a minimum of three temperature probes to monitor temperature within the process. Internal heating coils will be used to heat the digestate. The three tanks will operate on a rotational/batch basis, each serving a specific rotating function i.e. Step 1 receiving the digestate, Step 2 holding and heat, and Step 3 empty by pumping to the digestate storage tank. This rotation cycle shifts hourly (i.e. >60mins).

3.3.7.7 Digestate Storage Tank

Pastuerised digestate will be stored in a reinforced concrete tank with several submerged mixers to ensure that digestate can be mixed prior to collection by trucks. The digestate storage tank will be uninsulated. The roof will be a twin layer gas membrane domed roof with gas collection to the gas system. Digestate storage capacity will be minimum 4 days at full production.



3.3.7.8 Buffer Storage Tanks

Two buffer storage tanks will be provided to allow for efficient site operation for the transfer of liquid feedstocks. Liquid feedstock will if required be pumped to buffer storage in advance of the Liquid Pre Storage Tank. The buffer storage tanks will be constructed in reinforced concrete with submerged mixers. The buffer storage tanks will be uninsulated. Buffer storage capacity will be approximately $1,000\text{m}^3$ ($2 \times 500\text{m}^3$). The buffer storage tanks will be connected to the Odour Abatement system (See Section 3.3.8).

3.3.7.9 Digestate Loading Tank

A digestate loading tank will be provided to allow for efficient pumping and transfer of digestate. Pastuerised digestate will be pumped from the digestate storage tank and the digestate loading tank. The digestate loading tank will be constructed in reinforced concrete with submerged mixers to ensure that digestate is mixed prior to collection by trucks. The digestate tank will be uninsulated. The roof will be flat with a connection to the Odour Abatement system. Digestate storage capacity will be approximately 150m^3 , i.e. 6-7 liquid vacuum tankers loads.

3.3.7.10 Tank Farm Building

There will be a building within the tank farm as shown in Drawing No. P24188-FT-XX-XX-DR-CE-1790 in Volume 4 of this EIAR. It will be used for mechanical and electrical equipment and controls for the tank farm.

3.3.7.11 Tank Farm Bund

The tank farm bund is designed in accordance with Guidance to Storage and Transfer of Materials for Scheduled Activities (EPA, 2004). The tank farm will be bunded in its entirety to ensure enough containment is provided in the unlikely event of a leak at the facility. The bund will measure $18,900\text{ m}^2$ with a depth of 2.15m (including 0.25m freeboard) giving a total capacity of $35,910\text{ m}^3$.

The tank farm bund will be impermeable and provide the required storage volume for the proposed tank farm i.e. the greater of; 110% of the largest single tank volume (110% of $12,206\text{ m}^3 = 13,229\text{ m}^3$) or 25% storage of the sum of all tanks (25% of $133,904\text{ m}^3 = 33,476\text{ m}^3$) contained within the bund. The tank farm bund will be designed and submitted to the EPA for approval in advance of construction in accordance with the conditions of the IE licence. It will be subject submission of construction quality assurance certification to the EPA prior to operation and regular integrity testing as a licence condition.

The bunded area will be at a lower level than the surrounding areas and will be accessed via a dedicated access ramp.

Rainwater falling within the bunded area will drain to a collection sump, from where bund water will be pumped to the process water tanks or storm water storage lagoon (See Section 3.4.11). Pumping from the bunded area will be automatically controlled via level sensors. Water pumps will activate whenever collected rainwater exceeds a predetermined "high level" in the collection sump and the pumps will continue to pump until the predetermined "low level" is achieved.

To maintain the integrity of the bunded area and prevent pumping during unlikely events such as fire and/or a tank leakage the following control measures will be employed. The rainwater pumps will be programmed (via the site SCADA system) to automatically disable in the event of a site alarm e.g. fire alarm, leakage alarm.



Independent to this system it is proposed that a Continuous Emissions Monitor (CEM) will be installed within the bunded area rainwater collection sump. The CEM will monitor a set parameter or number of parameters (e.g. electroconductivity, pH) on a continuous basis. The default automatic pump control status will be OFF. Only if all sensors are measuring within preset operational criteria (i.e. those expected for rainwater) will the CEM allow the installed pumps to switch to ON status and start pumping.

3.3.8 Odour Abatement System

The solids reception, liquid reception and solid digestate building will be maintained under continuous negative air pressure via connection to the odour abatement system.

The ventilation and odour abatement system is designed to achieve a minimum of two air changes per hour in all areas with three air changes proposed in the solid reception building bunker area.

The odour abatement system will be designed to treat 100,000 m³/hr with an odour destruction efficiency of 95-99.5%. The maximum odour concentration from the odour treatment system is 1,000 OU/m³. The stack height is 35 m above ground. The odour abatement system performance will be operated in accordance with the conditions in the EPA IE licence.

Details with respect to building footprints, heights, volumes and design abstraction rates are shown in Table 3-4. The total treatment volume will be lower than shown as air changes per hour are dependent on time of day. During days, doors are opened to allow feedstock unloading and digestate loading and air change is higher than night time when all doors closed and no feedstock handling. Total air volume for treatment is 100,000 m³/hr.

Table 3-4: Odour Unit Metrics

Area	Volume (m ³)	Air Changes per Hour	Treatment Volume (m ³ /hr)
Solids Reception Building - Bell Jar	7,956	2	15,912
Solids Reception Building - Bunker Area	12,002	3	36,006
Solids Reception Building - Pretreatment Area	12,025	2	24,050
Solid Digestate Storage Area	8,932	2	17,864
Liquid Reception Building	6,076	2	12,152

The proposed odour abatement system will be BAT compliant and is widely employed in the UK, Sweden and Denmark in waste treatment and anaerobic digestion facilities dealing with odour laden exhaust gas streams.

The abatement system includes a combination of Ammonia (NH₃) Scrubbing, High Intensity Ultraviolet (UV), Photo Chemical Oxidation and Activated Carbon Filtration technologies enabling the system to achieve high levels of odour removal for all odorous species that could be generated from the onsite activities. Selected air streams will also be subject to advanced Hydrogen Sulphide Pre-Filtration. Drawing No. P24188-FT-XX-XX-DR-CE-1720 Odour Abatement Unit: Elevation Section and Details is in Volume 4 of this EIAR.



3.3.8.1 Ammonia Scrubber

The process can give rise to ammonia emissions. An ammonia scrubber is used for an efficient ammonia removal. It consists of two “packed towers”, filled with inert packing materials. Water conditioned with sulphuric acid referred to as a scrubbing liquor is also used in the system. The ammonia containing airstream is introduced at the base of the tower and flows upward through the packing. The acidic scrubbing liquor is distributed evenly from the top and flows downward by gravity. As the air and liquid pass counter-currently over the inert packing, ammonia transfers from the gas phase into the liquid and reacts with the acid to form a stable ammonium salt (e.g. ammonium sulphate).

The packing materials provide a larger surface area for the necessary chemical reaction, promotes turbulence, increases residence time, and ensures efficient mass transfer within a compact footprint. The water which contains ammonium sulphate is drained when concentration reaches a threshold (25%) and will discharge to the anaerobic digestion process for treatment.

Once treated by the ammonia scrubber; the air undergoes further treatment via high intensity UV, photo chemical oxidation and activated carbon filtration. Some air streams will be pre-treated before the ammonia scrubber, as described in the next subsections.

3.3.8.2 Photo Chemical Oxidation

Photo Chemical Oxidation oxidises volatile organic compounds (VOCs) and eliminates odour through high intensity ultraviolet (UV) light, ozone, and photo chemical oxidation supported by special purpose catalysts. The UV reactor achieves odour reduction of up to 90% on its own. Using photolysis, the UV reactor breaks down particles, creates ozone and converts ozone into free oxygen radicals. The radicals react with the odours compounds to neutralise the odour. The dual bed activated carbon filters act as a polishing step in the odour treatment process prior to discharge to the atmosphere via the stack.

3.3.8.3 Activated Carbon Filtration

Activated carbon filtration removes odorous compounds by adsorbing them onto the surface of porous carbon media. Odorous air is drawn through a vessel containing granular or pelletised activated carbon with a very high internal surface area. As the air passes through the carbon bed, odour-causing gases such as hydrogen sulphide and volatile organic compounds (VOCs) are physically and chemically bound to the carbon surface. Carbon media is replaced or regenerated once adsorption capacity is exhausted.

3.3.8.4 Hydrogen Sulphide Pre-Filtration

Selected odour sources will be subject to hydrogen sulphide prefiltration prior to entering the ammonia scrubber tower. These sources include the buffer storage tanks. The hydrogen sulphide prefiltration system is a specialist iron based media used for the removal of odorous sulphur compounds, primarily hydrogen sulphide (H₂S). Odorous air is passed through a vessel containing the granular hydrogen sulphide prefiltration iron oxide media. As the air flows through the bed, hydrogen sulphide reacts chemically with the iron oxide within the media to form stable, non-odorous iron sulphide compounds. This irreversible reaction removes sulphur based odours effectively at ambient temperatures without the use of chemicals or liquids. The iron oxide media is replaced once its reactive capacity is exhausted.

An Odour Management Plan (OMP) will be implemented as part of the Environmental Management system (EMS) for the IE licence. As noted above, odour will be controlled in accordance with the conditions of the EPA IE licence.



3.3.9 Heating Centre

The proposed heating centre will be a reinforced concrete substructure with a cladded, steel portal frame. The roof will accommodate solar panels.

It will provide renewable heat for use within the biogas upgrading and anaerobic digestion process. Heat will be generated by 2 No. 4 MW wood biomass boilers. Approximately 13,000 tpa of biomass will be required to produce the heat demand of the proposed development. From an energy point of view, biomass is defined as organic matter (based on carbon, hydrogen and oxygen) of non-fossil origin that has an intrinsic chemical energy content. It includes all terrestrial and aquatic vegetation, better known as virgin biomass, and all the biodegradable organic waste, such as municipal solid waste, animal waste, agricultural and forestry residues, and certain types of industrial waste. The biomass boiler at the proposed development will utilise indigenously sourced virgin wood chips, RED III compliant for heat generation. Wood chips are shown in the photograph (KSM Bioenergy) in this section.

The principal consumer of heat generated in the heat centre will be the biogas upgrading plant for the regeneration of amine (See Section 3.4.16). It also provides heat for the digestion and pasteurisation processes. The heating centre will contain the following:

- Biomass Delivery Bunkers
- Biomass Storage Bunker
- Biomass Boilers
- Biomass Boiler Exhaust Air Treatment System
- Heating Centre Exhaust Stack
- Ash Handling System

Each of these are described in the following sections. Drawing No's P24188-FT-XX-XX-DR-CE-1745 - 1748 Heating Centre Plans, Elevations, Sections and Details are in Volume 4 of this EIAR.



3.3.9.1 Biomass Delivery Bunkers

Biomass will be delivered to site by articulated or fixed body tipper or walking floor trailers. The biomass delivery vehicle will reverse into position at the biomass delivery bunkers external to the heating centre building. Two delivery roller access doors will open, and biomass will be emptied by walking floor into two below ground bunkers made of reinforced concrete. A screw conveyor or gantry crane will then empty the delivery bunker into the main biomass storage bunker within the heating centre. An external type of delivery bunker is shown in Figure 3-11.



Figure 3-11: Biomass Delivery Bunker (Lin-Ka Energy)

3.3.9.2 Biomass Storage Bunkers

The biomass storage bunker will comprise a reinforced concrete structure contained within the main heating centre building. The bunker will provide approx. 4 days storage of biomass materials to allow for continue boiler operations during non-delivery periods e.g. Sundays and Bank Holidays.

3.3.9.3 Biomass Boiler

Biomass will be fed by a pusher into the biomass boiler combustion chamber. The combustion chamber is designed to ensure complete and efficient combustion of the biomass. Air will be forced into the combustion chamber by a ventilator fan to drive combustion. Heat generated within the boiler will be transferred via a heat exchanger to water for use elsewhere. Ash generated from combustion known as bottom ash will be collected in the base of the combustion chamber and augured to the ash handling system. Flue gas will travel onward to the exhaust air treatment system.



3.3.9.4 Exhaust Air Treatment System

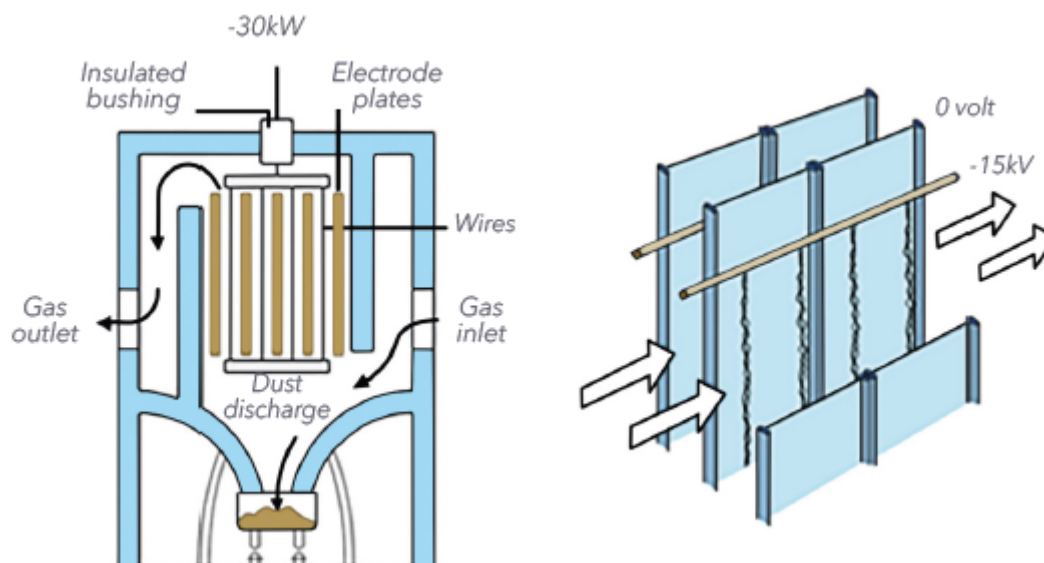


Figure 3-12: Electrostatic Precipitator Diagrammatic (Lin-Ka Energy)

The flue gas system cleans exhaust gases from the boiler to mitigate any potential emissions to air. The gas passes through two main cleaning stages; a multicyclone and an electrostatic precipitator (ESP) before a flue fan moves it safely out through the heating centre stack. Together, these components ensure particle emissions stay below 30 mg/Nm³.

1. Multicyclone

The hot flue gas leaves the boiler through insulated pipes and enters the multicyclone. This device spins the gas so that larger dust particles are separated and collected. It is built from heat-resistant steel and includes two access hatches for cleaning. Collected ash falls into an outlet where an auger transfers it to the boiler's ash system.

2. ESP (Electrostatic Precipitator) Filter

After the multicyclone, the gas enters the ESP, which removes the fine particles that the cyclone cannot capture. The ESP uses electrical charging to trap these particles, and it cleans itself automatically. A small air supply is required for operation. With the ESP installed, emissions stay below 30 mg/Nm³ (compared to about 150 mg/m³ without it). All collected dust is discharged into a shared ash container.

3. Flue Fan

The flue fan sits after the ESP and maintains the correct negative pressure in the combustion chamber. It is frequency-controlled and built with 20% extra capacity to handle sudden changes in system demand. Heat-resistant sleeves and rubber mounts reduce vibration and noise. A cleaning flap on the fan housing allows easy maintenance.



3.3.9.5 Heating Centre Exhaust Stack

Treatment exhaust air emissions will be exhausted to atmosphere via the heating centre exhaust stack. The exhaust stack will be fitted with a range of continuous emissions monitors (CEMs) for, NO_x and dust to ensure compliance with limits in the European Union (Medium Combustion Plant) Regulations 2017 (S.I. 595 of 2017).

The heating exhaust stack will be one chimney containing 2 no. 20 m high and 500mm diameter stacks. Emissions from this stack will be conditioned by the EPA IE licence.

3.3.9.6 Ash Handling System

Bottom ash from the biomass boiler and fly ash collected within the ESP will be conveyed to one of two ash storage containers. Approximately, 133 tpa of ash will be produced from biomass combustion. Containers will have a capacity of approximately 10 tonnes and will be transported by a standard "hook lorry" under a waste collection permit for recovery or disposal offsite at an appropriately authorised facility (see Figure 3-13 for typical ash handling container). The ash is non-hazardous as generated only from combustion of biomass (woodchip).



Figure 3-13: Typical Ash Handling Container (KSM Bioenergy)

3.3.10 Desulphurisation Plant

The desulphurisation plant is located to the west of the site, and west of the gas upgrade plant. It consists of a series of 8 no. hydrogen sulphide filtration towers which are constructed using insulated cladding material. The tanks are 3.6m diameter and 10m high. Each roof has a manhole and an inspection hole. Near the base of each tank there is a manhole and a gas outlet. There are 4 no. control units, each one servicing 2 no. hydrogen sulphide filtration towers and 1 no. activated carbon filter unit. All the tanks and containers are built on reinforced concrete foundations. See Volume 4 Drawings.

3.3.11 Granulated Activated Carbon Filter Plant

The granulated activated carbon filter plant is located to the west of the site, adjacent the desulphurisation plant. It consists of 4 no. filter towers. The towers are constructed in steel and are 2.6m in diameter and 8.3m high. The towers are built on reinforced concrete foundations.



3.3.12 Gas Upgrade Plant

The proposed biogas upgrading plant is an Amine based technology. It is located in front of the desulphurisation plant. It is built on a reinforced concrete foundation. It consists of a raw biogas inlet that feeds into 3 no. blower units, which flows to the granulated activated carbon to the absorption column which separates the carbon dioxide by Amine liquid. From here methane is sent to the renewable gas container (for odourisation and conditioning). The rest is sent to the stripper column which uses heat to remove the carbon dioxide from the enriched amine. There is a heat controller container connected to this to control it and process cooling equipment to control the temperatures. There are an additional 2 no. granulated carbon filters. See Volume 4 Drawings.

3.3.13 Carbon Dioxide Liquefaction Plant

The carbon dioxide liquefaction plant is located directly south and adjacent to the desulphurisation plant and the gas upgrade plant. It will liquefy the carbon dioxide generated in the AD process so that it can be transported off site as a renewable source of biogenic CO₂. The plant It is built on reinforced concrete foundations, and it consists of equipment to compress and cool carbon dioxide to covert it from a gaseous state into a liquefied state. See Volume 4 Drawings. The equipment includes:

- Liquid CO₂ Tanks
- Air Cooler Units
- Compressor Containers
- Process Containers
- Refrigeration Container
- H₂S adsorber
- CO₂ scrubber
- CO₂ distiller
- Deodouriser
- Gas Dryer
- Dust filters
- Gas Cooler Unit
- Superheater

3.3.14 Biomethane Network Entry Facility (BNEF)

A BNEF will be constructed onsite in accordance with Gas Networks Ireland (GNI) specifications and requirements. The BNEF will comprise a single container unit within a secure fence compound. The unit will be sized to manage a maximum of 3,300 m³/hr of biomethane and a minimum of 2,700 m³/hr. Average gas flow through this unit will be 2,600 m³/hr. See Volume 4 Drawing No's P24188-FT-XX-XX-DR-CE-2600 and 2601 Proposed Grid Entry Unit (Plan and Elevations).

See Section 3.3.20 for details off the proposed gas network connection.



3.3.15 Gas Flares

Two emergency gas flare will be located to the west of the bunded tank farm. A gas flare is a self-contained unit with a stack with gas is combusted at over 850 °C for a specific retention time to ensure combustion of methane to carbon dioxide and destruction of trace including odours. It is powered by electricity and has a SCADA system to control the operational parameters. Each of the flares will be capable of treating 3,000 m³ of gas per hour. Gas flaring will be used in event that the gas injection unit is inoperable, and gas storage has reached capacity. The installed flares will have an over operational capacity of the expected hourly biogas production (6,000 m³/hr) and will ensure the safe and complete combustion of the raw biogas during an emergency,

Flaring of gas will only be considered as a last resort and will only occur during abnormal operating conditions e.g. system breakdown, rejection of gas by BNEF or during extended maintenance periods. There is capacity under normal operating conditions to recycle gas back into system, upgraded again and store for 3-4 hours before re-entry into BNEF. It is estimated that in a normal year the gas flare will operate for approximately 200 hours, principally during planned maintenance periods and for periodic flare testing. A typical enclosed gas flare is shown in Figure 3-14.

The operation of the flare during abnormal conditions and flare emissions will be regulated by the IE Licence issued by the EPA. There will be continuous monitoring of the flare during operations, recording percentage of methane, carbon dioxide, oxygen and hydrogen sulphide along with flow, temperature and pressure. See Volume 4 Drawings.



Figure 3-14: Typical Enclosed Flares (Himmel)



3.3.16 Administration Building

A dedicated administration building will provide for all site operations and administration staff. The building will include the following.

- IT/server room
- 4 No. Management offices
- 2 No. open plan offices (capable of seating 20 people collectively)
- Reception office
- Reception Area/ Foyer
- Conference Room
- 2 No. W.C.'s inc. 1 No. accessible
- Canteen
- Storeroom
- Male Changing Room including
 - Accessible W.C. and Shower Room
 - Externally Accessible W.C.
 - Shower Facilities
- Locker and Changing AreaFemale Changing Area
 - Accessible W.C. and Shower Room
 - W.C.
 - Locker and Changing Area
- Open-air viewing platform accessed from an internal staircase.

The building is orientated and glazed so staff can view the near entire site. The roof will accommodate solar panels. The open-air viewing platform is designed for visitor access. See Volume 4 Drawing No.s P24188-FT-XX-XX-DR-CE-1740 to 1742.

3.3.17 Drainage Infrastructure

Drawing No's P24188-FT-XX-XX-DR-CE-0500 to 0506 in Volume 4 of this EIAR show the proposed drainage layout. The proposed development includes the installation of a comprehensive, segregated drainage network for the facility. The infrastructure consists of collection, control, and storage systems for:

- storm water/rainwater
- wash water
- process water
- foul water

The drainage strategy for the proposed development has been designed to physically interrupt potential pollution pathways, control runoff rates, and provide multiple, redundant stages of treatment, containment, and isolation.



Figure 3-23 in Section 3.4.11 illustrates the water management strategy. This section describes the drainage infrastructure. Section 3.4.11 describes the operation of the drainage infrastructure.

3.3.17.1 Storm and Rain Water Collection Areas

The proposed development has a fully separated drainage system for clean storm and rain water, comprising distinct hydraulic networks. The networks include;

- a drainage network serving the yard and circulation areas
- a drainage network serving the bunded tank farm
- a roof water drainage network collecting rainwater runoff from building roofs
- an interceptor drainage network collecting clean overland flows from surrounding lands and quarry cut areas

All storm and rain water is collected in the proposed storm water lagoon. The storm water lagoon is described in Section 3.3.17.4.

Water collected from the yard and circulation areas is collected via a network of linear drainage channels and gulleys. No feedstock or digestate handling activities will be conducted externally as all unloading and loading takes place indoors. Collected yard area water is gravity fed via a Class 1 Full Retention Oil interceptor to the main collection chamber. The interceptor is included for the separation of any potential minor hydraulic oil spills or leaks from rainwater draining across the yard area.

Water collected in the tank farm bund drains to one of two sumps in the bund. If it is determined that the bund water is clean (See Section 3.3.7.11), collected water is pumped directly to the storm water lagoon.

Water collected from the roof areas is gravity fed to the main collection chamber.

The proposed facility is located in a local depression due to past quarrying. Overland water flows from the surrounding higher areas and quarry cut are collected in an interceptor drain and flows via gravity to the main collection chamber.

The main collection chamber is located to the east of the storm water lagoon. The reinforced concrete chamber will be equipped with three high-capacity pumps (2x duty and 1 x standby). An automated SCADA control system will control the pumping of water to the storm water lagoon during rainfall events. Storm water pumps will be electrically operated. An automatic diesel generator will provide back-up power to these pumps in the event of a power supply interruption.

The proposed development has a significant daily water demand; most of this demand will be supplied from the storm water lagoon. An outlet pump chamber controls the flow of water from the storm water lagoon back to the AD process water tanks under normal operating conditions. There is an automated valve in the outlet pump chamber that allows discharge under specific conditions to the external drainage network. Those conditions are detailed in Section 3.4.11.

3.3.17.2 Wash Water and Process Water Collection Areas

The internal building drainage network will collect wash water and runoff from the solid feedstocks or digestate storage areas and convey it to the process dedicated drainage collection area in each building i.e. Solid Reception, Liquids Reception, and Solid Digestate Storage buildings)



The internal drainage network will drain via gravity to dedicated wash-water collection sumps. A sealed pipe network and pumping system will transfer collected wash water from the internal sumps directly to the Liquid Feedstock Reception Tank for use in the anaerobic digestion process. See Section 3.3.7.4

3.3.17.3 Foul Water

Foul water i.e. municipal wastewater will be collected from administration building and site welfare units. All foul water will be directed to a Foul Storage Tank. Foul storage tanks will be provided three locations across the site. Each tank will serve the following welfare infrastructure

- Administration Building – Canteen and Welfare Facilities
- Solid and Liquid Reception Building - Welfare Facilities
- Heating Centre - Welfare Facility

A dedicated foul drainage network will connect the welfare facilities to the three proposed foul water tanks.

3.3.17.4 Storm Water Lagoon

The proposed storm water lagoon will be located in the southwest of the site at the entrance. The storm water lagoon will be constructed with an earthen embankment i.e. a raised embankment made from compacted soil. The lagoon will be lined with a 1mm LLDPE Basal liner. The lagoon will also include a 1mm LLDPE floating cover to minimise the potential for microbial or algae growth. The floating cover will be equipped with a surface rainwater recovery pump discharging to the to the main collection chamber. This recovery pump will collect rainwater falling on the lagoon cover.

The effective lagoon depth is 3.0 m, with a total depth of 3.6 m. This includes a 0.30 m freeboard and a 0.30 m sump for particle sedimentation. The lagoon inlet level is fixed at the lowest level of 44.00 m. Since the gravity discharge system is approximately 1 m above this level, an overflow pump and pressure pipes are required to transfer excess water into the lagoon when the water level rises from 1 m up to 3 m. The gravity outfall will also be fitted with a flap valve to prevent reverse flow.

The design flows—and therefore the maximum volume of water to be managed within the lagoon using an additional pump station—corresponds to the 30 year return period event. This pump station (2 x duty pumps and 1 x standby pump) will operate both as a process water pump and as a drainage/dewatering pump. It will extract water from the lagoon and supply the process tank, with an approximate hourly demand of 2.12 L/s when dewatering for large storm events, it will assist the lagoon extract any excess water when the water depth reaches 3 m or greater. Under normal conditions storm water from the lagoon will be pumped via a dedicated internal rising main to the process water storage tanks located at the far eastern extent of the site, opposite the Solids Reception Building.

In the scenario where the storm water lagoon is at capacity, the process water tanks are at capacity and there is a one in 30 year storm event, clean excess water will be discharged to the existing drainage system in the R448 that flows to Powerstown Steam at greenfield rates over a 24 hour period. Refer to Section 3.4.11 for the operation of the drainage system.



3.3.17.5 Process and Fire Water Tanks

Process water tanks will act as the primary water supply for the anaerobic digestion process. The proposed process water tanks will be used to provide all wash down water required on site. The process water tanks will supply water as required to solids feedstocks post biomixing (See Section 3.4.4) to aid in pumping i.e. to partially liquefy the solid feedstock. The primary water supply for these tanks is from the storm water lagoon.

A groundwater supply well has been installed on site. The groundwater well will provide the balance of the process water to the AD process.

3.3.18 ESB Substation

The proposed facility includes for the provision of two ESB substations:

- 10-20 kVa Medium Voltage Substation – Construction and Early-Stage Commissioning Phase
- 38 kVa Medium Voltage Substation – Operational Phase

The 10-20 kVa substation is proposed to provide a temporary power import capacity during the construction and early-stage commissioning phases of the development of up to 2MW. See Drawing No. P24188-FT-XX-XX-DR-CE-1770.

The 38 kVa network is proposed to provide permanent power import for the operational phase of the development of up to 7MW. See Drawing No's P24188-FT-XX-XX-DR-CE-1780-1783 in Volume 4 of this EIAR.

The ESB substation will be located in the south of the site, adjacent the LGV entrance. The ESB substation will be designed as per ESB Specifications. The proposed substation will be constructed to the requirements of ESB Networks.

3.3.19 Ancillary Infrastructure

3.3.19.1 Storage of Chemicals

Cleaning agents and process chemicals will be used at the proposed facility. They will be stored onsite in bunded areas in accordance with best practice and in compliance with the relevant regulations. Chemicals to be used at the proposed development and their method of storage are as follows:

Chemicals	Volume Per Annum	Location
Window spray (400 ml)	15 x	Administration building
Cleaning agent	10 x	Administration building; workshop; feedstock building
Polyamine-liquid to boiler water	200 L	Bunded pallet in Boiler building
Hydrocarbon/CO2 cooling agent	3000 L	IBC CO2 liquefaction unit and heating area
Inhibited Sulphuric acid	2000 L	IBC Feedstock building
Sodium hydroxide	1000 L	IBC Feedstock building
Ferric powder	2000 kg	Bunded pallet Feedstock building



Chemicals	Volume Per Annum	Location
Inhibited hydrochloric acid	2000 L	IBC Feedstock building
NPK fertilizer for biofilters	3,000 L	IBC Gas cleaner, upgrading area, airtreatment area
Kuvette test	10 kg	Bunded pallet Laboratory
Calibration liquid x3	5 kg	Bunded pallet Laboratory
Sulphuric acid (Laboratory)	5 L	Bunded pallets Liquid reception, laboratory
Hydrochloric acid (Laboratory)	5 L	Bunded pallets Liquid reception, laboratory
Anti-foam	100 L	Bunded pallet Upgrading area
Glycol cooling liquid	2,500 L	IBC Upgrading area or boiler room
Salt tablets	100 kg	Bunded pallet Upgrading area or boiler room
Drying agent (Sorbead)	2000 kg	Bunded pallet Upgrading area or boiler room
Amine-liquid	12,000 L	Bunded pallet Upgrading area, inside container
Biogas storage	34,278 m ³	Various gas storages
Gearoil	2,000 L	Bunded pallets in Workshop
Hydraulic oil	500 L	Bunded pallets in Workshop
Brake cleaner (400ml)	15 x	Bunded pallets in Workshop
Motor oil	200 L	Bunded pallets in Workshop
Gasoline	5 L	Bunded pallets in Workshop
Silicone spray (400 ml)	20 x	Bunded pallets in Workshop
Ceramic paste (400 ml)	20 x	Bunded pallets in Workshop
Cockpit spray (400 ml)	15 x	Bunded pallets in Workshop
Grease on tube (400 ml)	15 x	Bunded pallets in Workshop
Autoshampoo (400 ml)	50 L	Bunded pallets in Workshop
Universal grease (400 ml)	40 x	Bunded pallets in Workshop
Windshield wiper fluid	100 L	Bunded pallets in Workshop
Adblue	1000 L	Bunded pallets in Workshop
Diesel for wheel loader and vehicles	5000 L	Bunded Diesel Tank
Anti-rust, WD-40 (400 ml)	20 x	Workshop; feedstock building
H ₂ SO ₄ , Sulphuric acid 96%	79 m ³	Bunded Tank at Odour Control Unit
NaOH, Sodium Hydroxide	280 m ³	Bunded Tank at Odour Control Unit
H ₂ O ₂ , Hydrogen Peroxide	114 m ³	Bunded Tank at Odour Control Unit
Activated Carbon	23 tonnes	Bunded Pallet in Workshop
hydrogen sulphide prefiltration (Sulphared)	1.5 tonnes	Bunded Pallet in Workshop



All chemicals will be stored in accordance with IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities (EPA, 2004) and will be conditioned by the EPA IE licence.

3.3.19.2 Fire Water Supply

Fire water supply will be provided from the Process Water Tanks (See Section 3.3.17.5). Process Water Tanks will be controlled to at all times maintain the minimum fire water supply design volume (240 m³). The process water tanks will supply a series of fire hydrants located about the site. Hydrants will be supplied by a 150mm rising main by means of an electrical pump operating at 3-4 bar operating pressure⁸. Additional water supply can be provided by the surface water lagoon or groundwater pump supply. Emergency diesel power electrical generation will be used to power the groundwater and fire hydrant pumps in the event of power failure.

3.3.19.3 Firewater Retention

Firewater retention will be provided in accordance with the Guidance on Retention Requirements for Fire Water Runoff (EPA, 2019). In accordance with the Fire Water Risk Assessment (see Appendix 3.2 of Volume 3 of this EIAR) undertaken for the proposed development the worst-case scenario the overall amount of firewater retention capacity required at the proposed facility is 2,101 m³.

Fire water retention will be provided within the storm water lagoon. In the event of a fire, automated drainage controls system (See Section 3.3.17) will pump firewater to the surface water lagoon for retention. Post event the storm lagoon would be emptied and transferred off site by an authorised contractor for treatment at an appropriately authorised facility. In that case, the storm water lagoon would be cleaned, before refilling with groundwater or stormwater. The storm water lagoon provides 2,385 m³ of fire water storage.

3.3.19.4 Site Security

The proposed facility will include CCTV across all site areas internally and externally including the site access route and boundaries. It is proposed that CCTV will be monitored by site staff during operational hours and supported by a remote monitoring service outside operational hours. A 2.4 m high powder-coated steel palisade will be installed along the L3045. The existing post and wire fence will be removed, and the hedge line will be retained. Any hedge trimming required to facilitate the installation of the fence will be carried out outside of bird nesting season (March to August).

⁸ Fire Water Volume and Hydrant Supply requirements as per the requirements of the Carlow Fire and Rescue Service.



3.3.19.5 Lighting

The facility will be appropriately illuminated internally and externally by appropriate energy efficient lighting. The facility lighting will be designed to minimise light pollution beyond the facility boundary. It is assumed that the facility will always be illuminated during set operational hours with task lighting provided in key operations areas. Outside operational hours, passive infrared (PIR) or movement detection sensors will be installed to control lighting around the site for security purposes. Installed lighting types will be dependent on the area to be illuminated. Typical lighting designs for key areas are described as follows:

- The solids reception building, liquid reception building, solid digestate building and heating centre will be internally illuminated by high bay energy efficient LEDs. This high bay lighting will provide a high level of light internal to the building.
- The circulation yard will be illuminated by high efficiency LED lighting mounted to the building envelope where available, alternatively 6-8m lighting columns will be placed at 20-40m spacings about the yard perimeter.
- The tank farm and gas upgrade plant area will be illuminated at a low level only (<2m) in and around the key tank components and infrastructure such as pumps valves etc.
- The administration and welfare building, and weighbridge will be illuminated internally with energy efficient lighting. Externally these areas will be illuminated during operational and waste acceptance. Externally car park areas will be down lighted from medium height columns (4-6m).

3.3.19.6 Landscaping

Soft landscaping including native hedging will be implemented on site. This is detailed in Drawing No. P24188-FT-XX-XX-DR-CE-3000 Proposed Landscaping Plan included in Volume 4 Drawings prepared by the landscape and visual impact and biodiversity competent experts.

3.3.19.7 SCADA

A supervisory control and data acquisition (SCADA) system is a system of software and hardware elements that allows the following:

- control industrial processes locally or at remote locations
- monitor, gather, and process real-time data
- directly interact with devices such as sensors, valves, pumps, motors etc. through human-machine interface software
- record events into a log file system
- provide warning and system alarms

The SCADA will be used to monitor and control the anaerobic digestion process, biogas upgrade, heating centre, grid entry unit, process water control, flares and continuous emissions monitoring devices.

3.3.19.8 Process Water Supply

A groundwater well has been installed on site to provide the required process water supply. The volume of water is below the threshold for an abstraction licence.



A yield test has confirmed supply and environmental testing confirmed water quality is fit for purpose.

Refer to Chapter 12 Soils, Geology and Hydrogeology for further information.

The majority of process water will be captured via rainwater harvesting. See Section 3.4.11.

3.3.19.9 Solar Panels

Solar panels covering a total area of 2,200 m² or approx. 1,300 panels will be installed across all available roof areas at the site. The proposed solar panels will be connected to the site “and will supply part of the overall site electrical demand during daytime hours. Solar power export from the site is not expected during standard operations. The solar panels are shown on the roof plans of the various buildings in Volume 4 Drawings of this EIAR.

The total estimated power provided by solar will be 430,000 kWh per annum.

3.3.19.10 Car Park

Based upon the maximum number of personnel that may potentially be on site at any one time (at shift changeover) the proposed development allows for a total of 40 no. regular staff parking spaces in addition to 2 no. disabled parking spaces. Of the total number of spaces, 25% (12 no.) are allocated as EV charging spaces, with the infrastructure designed to allow expansion to 100% EV charging provision in future years if required.

In addition, provision is made of 6 no. visitor spaces and 2 no. motorcycle parking spaces will be available for staff to use. There is bicycle parking in this area.

Cumulatively there are 48 no. car parking spaces, 2 no. motorcycle parking spaces and bicycle parking.

3.3.20 Proposed Gas Pipeline Route

Renewable natural gas (RNG) will be exported from the site via a gas pipeline. The proposed gas pipeline route is subject to a separate statutory consent. GNI is the Statutory Undertaker responsible for obtaining development consent for the proposed gas pipeline from the Commission for Regulation of Utilities (CRU). Separate consents are required for the construction and the operation of the pipeline. GNI has provided Greengate Biogas 001 Ltd. with a route that follows the road network. Drawing No. P24188-FT-XX-XX-DR-CE-2602 Proposed Gas Pipeline Route is in Volume 4 of this EIAR.

The proposed gas pipeline will be laid in the road network. The pipeline will be laid in the L3045 for 100 then turning onto R448 road travelling south from the site for c. 2.65 km to the intersection of the R448 and the L3038. The gas pipeline will then follow the L3038 / L3039 road northwards for c. 4.75 km before turning westerly along Milford Park Road (L7031). The pipeline will travel along Milford Park Road for c. 1 km before turning north along the L3043 road for c.1 km. The gas pipeline will connect to the Clogrennan AGI, located just off the L7031 road (c. 100m).

The route of the proposed pipeline will cross the River Barrow and the M7 motorway. The current road infrastructure crosses both of these features in overbridges. As the gas pipeline route is subject to a separate statutory consent and preliminary design has not yet been completed, this EIAR includes options for crossing watercourses and the M7 motorway as requested by GNI. GNI will be responsible for obtaining the necessary approvals from Carlow County Council and TII for the construction of the proposed gas pipeline.



Locations where the gas pipeline may deviate off the road are described in the following subsections:

3.3.20.1 Motorway Crossing

TII Structure (Eirspan Name Tomard Lower Road Overbridge 2 Ref no CW-M09-012.00) see Figure 3-15 to Figure 3-17. The L3038 crosses the M9 motorway within this structure.



Figure 3-15: Location of L3038 Overbridge across M9 Aerial View



Figure 3-16: Location of L3038 Overbridge across M9 Streetview



Figure 3-17: Location of L3038 Overbridge across M9 Motorway View



1. Based on pre application consultation with TII, it is proposed to by pass the structure by a trenchless construction methodology. It is assumed that Horizontal directional drilling (HDD) will be used to divert the gas pipeline under the M9 motorway. The appointed contractor may select an alternative trenchless construction technique if considered more appropriate. The final crossing methodology will be determined at detailed design by GNI for the consent application.

GNI will require a proposed motorway works consent under Section 53 of the Roads Act 1993 as amended to permit new infrastructure adjoining and under the motorway.

GNI will be required to seek approval from TII for the proposed network crossing. The proposed network crossing will be in accordance with TII publications as listed below and any updates:

- Requirements for the Reinstatement of Openings in National Roads CC-PAV-04007 (TII, 2019)
- Design for Durability DN-STR-03012 (TII, 2024)
- Specifications for Road Works - Trenchless Installation of Road Drainage and Service Ducts CC-SPW-02800 – Series 2800 (TII, 2009)
- CC-GSW-02800 Notes for Guidance on the Specification for Road Works Series NG280 (TII, 2009)
- CC-SPW-00500 —Specification for Road Works - Drainage & Service Ducts (TII, 2024)
- Technical Approval of Road Structures on Motorways and Other National Roads for structures (DN-STR-03001) (TII, 2025)

In consultation, TII stated, “where pipeline routing involves proposals to cross a Motorway Works Specific Deeds of Indemnities, arrangements for third party access or consent from TII in accordance with Section 53 of the Roads Act, 1993, is required. If deemed appropriate, the preferred method of necessary national road network crossings is by horizontal directional drilling (HDD) outside of the motorway reservation”.

Figure 3-18 shows the location of the crossing point. All works to install the pipeline will be outside of the Motorways Maintenance and Renewals Contract (MMaRC) boundary.

GNI will be responsible for obtaining the necessary approvals from Carlow County Council such as a road opening licence for the works in the L3037.

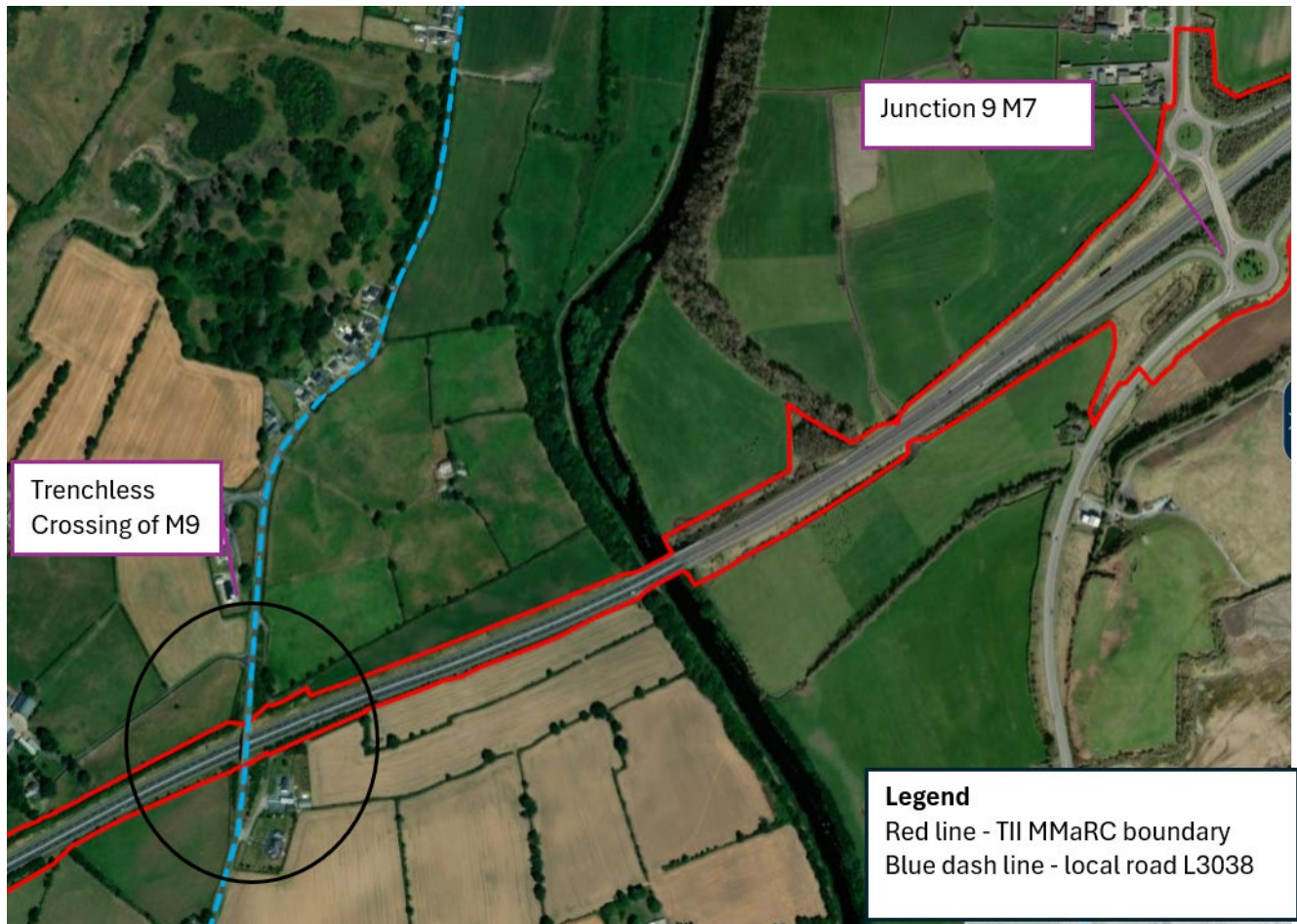


Figure 3-18: Location for Trenchless Crossing of M9

3.3.20.2 Cardinal Moran Bridge R448 crossing of River Barrow

The R448 is a regional road under the remit of Carlow County Council who stated in pre application consultation that the Council will not permit the use of the bridge to carry the proposed gas pipeline. This EIAR therefore includes an assessment of a trenchless construction methodology such as HDD to cross under the river and avoid the bridge.

The bridge is shown in Figures Figure 3-19 to Figure 3-21.



Figure 3-19: Cardinal Moran overbridge aerial view



Figure 3-20: Cardinal Moran overbridge street view



Figure 3-21: Cardinal Moran overbridge river view

3.3.20.3 Land Drains in L3043

There are two land drains crossing under the existing L3045 in Clogrennan. They were dry on each site visit but local knowledge suggests their existence. It is proposed to cross the two land drains using HDD. These are identified as crossing IDs B5 and B6.



3.4 Proposed Operation of the Proposed Development

The process flow for the proposed development is shown in Figure 3-6 and will broadly comprise the following operations.

3.4.1 Operational Hours and Staff

The proposed hours of operation are shown in the following table. Operational hours will be a condition of the EPA IE licence.

It is proposed that no import or export of feedstocks or products would take place on Sundays or Bank Holidays.

The following staff will be employed:

- 14 no. administrative/office based staff
- 14 no. operatives in 2 shift, 7 no. per shift
- 12 no. HGV drivers

Table 3-5: Operational Hours

Operations	Start Time	Finish Time
Plant operation including solid feedstock feeding, liquid feedstock feeding, odour management system and heating centre	Continuous	
Feedstock acceptance i.e. traffic movements	07:00 Monday-Saturday	19:00 Monday to Friday 14:00 Saturdays
Export of digestate	07:00 Monday-Saturday	19:00 Monday to Friday 14:00 Saturdays
Export of liquefied CO ₂	07:00 Monday-Saturday	19:00 Monday to Friday 14:00 Saturdays
Export of biomethane	Continuous	

3.4.2 Transport

The transport of feedstock and digestate will be controlled by Greengate Biogas 001 Ltd. A fleet of 12 bulk haulers and tankers will transport feedstock and digestate from and to farms under contract. Starting at opening time, the vehicles will leave the facility via the weighbridge loaded with digestate, drive to farms, unload the digestate and refill with feedstock and return to the AD plant. Each liquid tanker will be equipped with on board pumps and a robotic arm for loading and unloading on farm and at the anaerobic digestion plant.

On arrival at Powerstown Biogas, the automatic number plate recognition system will log the details of the arriving load. From the weighbridge drivers will proceed to the solids reception or liquids reception buildings to unload feedstock materials. Where aggregators are contracted to supply feedstock, the vehicles will be registered on the automatic number plate system.



The circulation yard will allow for the manoeuvring of all vehicles entering or exiting the solid and liquid reception building and solid digestate building. Vehicles entering the solids reception building will be directed to reverse to one of four reception bays in the solids reception hall. The liquid reception building has four reception lanes with drive through access. Therefore, eight vehicles can be loaded or unloaded at any one time.

The circulation yard will have space to accommodate vehicle queuing in the unlikely event of wait times to enter the reception building during peak delivery times.

Refer to Chapter 6 Traffic and Transportation for a description of traffic.

3.4.3 Proposed Feedstocks and RED III Compliance

The feedstocks are manures made up of beef, dairy, pig, poultry, horse and farmyard manures. These feedstocks are listed in Annex IX (Feedstocks for the production of biogas for transport and advanced biofuels) of RED III, EU Directive 2023/2413 as (f) animal manures and (e) straw. The application for development consent will include the feedstock menu. No feedstocks will be accepted that are not compliant with Annex IX.

Greengate Biogas 001 Ltd. has over 650 no. farmers under Letters of Intent (LOI) to supply 1.9 M tonnes of feedstocks and receive digestate from Powerstown Bioenergy. The Applicant coordinated these LOIs during 2024 and 2025 through a dedicated campaign to source feedstock. The team visited farms, collected samples for laboratory testing and agreed supply and return mechanisms. Seasonal variation in the supply of feedstock is a factor in Ireland due to the prolonged grazing season influenced by the temperate climate.

The applicant has identified double the quantity of feedstock which is required for the proposed diet. This surplus allows for flexibility of supply, futureproofing against changing farm practices and supplier changes etc.

The proposed feedstock mix is presented in

Table 3-6.

Table 3-6: Proposed Feedstock Mix

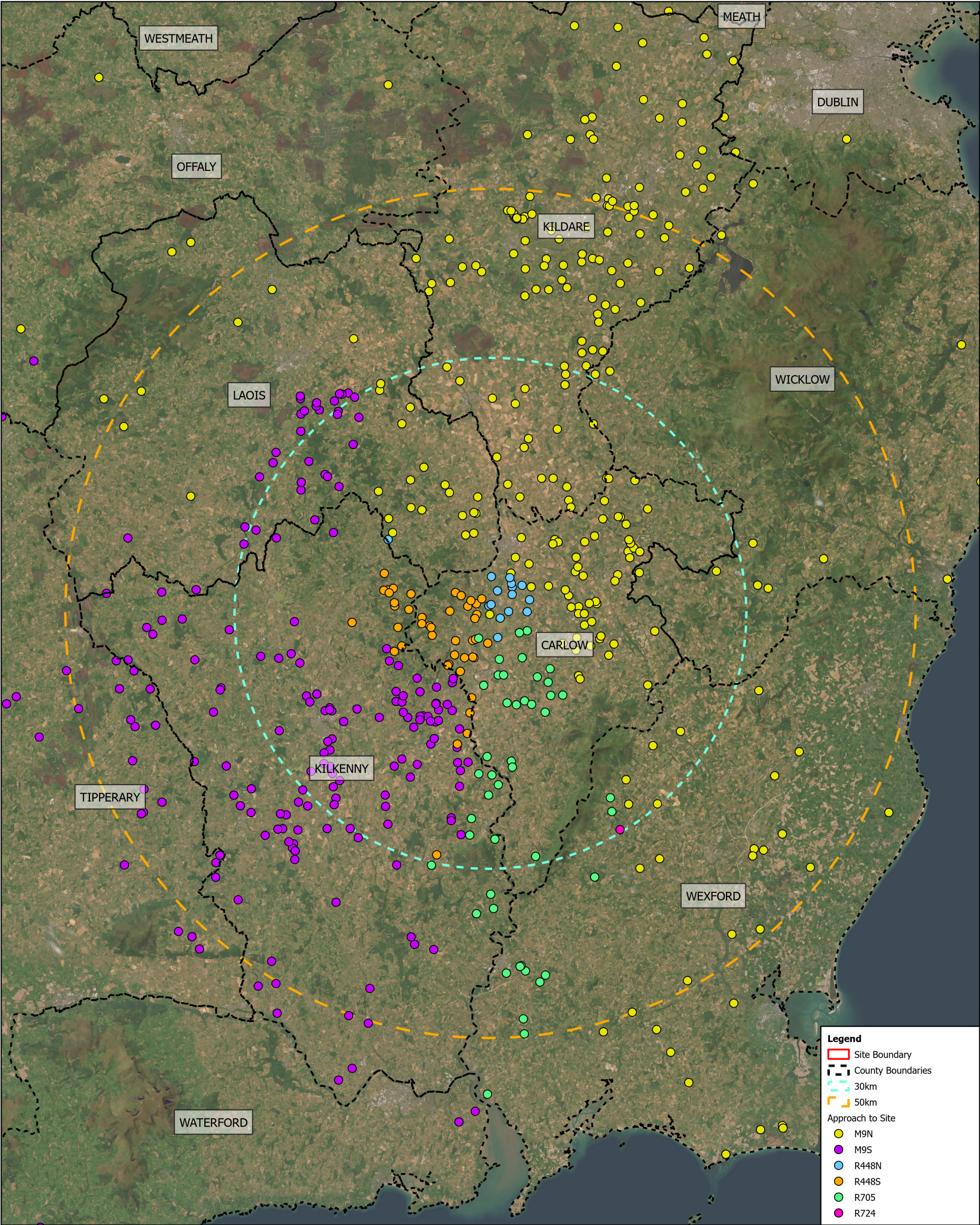
Feedstock	% of feedstock category in mix
Cow Slurry (Dairy)	8%
Cow Slurry (Beef)	25%
Pig Slurry	33%
Duck Slurry	6%
Chicken Manure	9%
FYM	12%
HG FYM	7%
Maximum Intake Feedstocks (tpa)	663,000



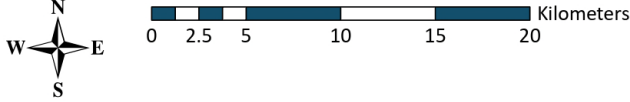
The maximum intake will be 663,000 tonnes per annum. The intake will be managed to ensure there is capacity in digestors, storage tanks and gas export. There will seasonal variations in the supply of feedstocks to the site. The main variation will be associated with the winter housing of dairy and beef cattle. Cattle slurry quantities will be highest during the winter months. The strategy to manage this is two fold:

- to contract with controlled finishing units (CFU) otherwise known as beef lots or cattle finishers in the catchment area who house mature beef cattle ready for slaughter all year round, and as such have a ready supply of slurry in the open season when other grazing cattle are out at grass, and
- dairy farms also produce slurry all year round with c.15% of the annual volume available at the milking parlour each day during the summer months

The proposed feedstocks are described in the following sections. The assessment of traffic movement of feedstocks is included in Chapter 6 Traffic and Transportation. Figure 3-6 shows the majority of feedstock suppliers who have signed letters of intent to supply the proposed development with feedstocks and receive digestate. Each dot represents a supplier, and the colours of the dots represent the transport routes. The dash line circles show a 35km radius and a 50 km radius from the proposed development.



TITLE:	Feedstock Facilities within Proximity of the Site		FIGURE NO: 3.22	
			CLIENT: 	
PROJECT:			SCALE: 1:400,000	REVISION: 0
	Powerstown Bioenergy		DATE: 22/06/2026	PAGE SIZE: A3



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3.4.3.1 *Proposed Feedstock Cattle Slurry*

Cattle slurry will be collected from the network of supplier farms in specialised articulated vacuum tankers controlled by the Applicant for transport to site.

3.4.3.2 *Proposed Feedstock Pig Slurry*

Pig slurry will be collected from a network of supplier farms in specialised articulated vacuum tankers controlled by the Applicant for transport to the proposed development.

3.4.3.3 *Proposed Feedstock Duck Slurry*

Duck slurry will be collected by aggregators in specialised articulated vacuum tankers for transport to the proposed development.

3.4.3.4 *Proposed Feedstock Poultry Manure*

Poultry manure will be collected from aggregators contracted by the Applicant typically in articulated or fixed body tipper trailers for transport to the proposed development.

3.4.3.5 *Proposed Feedstock Farmyard Manures*

Farmyard manures (FYM) will be collected from a network of supplier farms typically in articulated or fixed body tipper trailers controlled by the Applicant for transport to the proposed development.

3.4.3.6 *Proposed Feedstock High Grade Farmyard Manures*

HGFYM will be collected from a network of supplier farms typically in articulated or fixed body tipper trailers controlled by the Applicant for transport to the proposed development.

3.4.4 Solid Feedstock Handling

Solid feedstocks arriving in articulated or rigid body tipping trailers will reverse into the solid reception building as described in Section 3.3.4.

The entire solids reception building will be maintained under negative area pressure for the control of odour. See Section 3.4.20 for Odour Abatement System details. Negative air abstraction will be optimised by fabric detailing (leakage prevention) and internal segregation of high odour potential areas i.e. solids storage bunker.

Vehicles entering the solids reception building will be directed to reverse to one of four reception bays in the solids reception hall. The solids reception hall will operate a bell jar system for odour abatement. The bell jar system concept is described as follows

- Rapid shutter doors will allow access to the solids reception hall for incoming vehicles to reverse into the reception hall.
- Once the incoming vehicle is fully within the reception hall the reception hall door will close.
- Once closed, an internal roller shutter doors will open to allow access to the solids storage bunker.
- The incoming vehicles will reverse to the bunkers edge, tipping their load into the bunker area.



Once tipping is complete the now empty incoming vehicle will move forward and appropriate bunker roller door will close.

- Once the internal door is closed, the rapid reception bay roller shutter door will reopen, and the HGV will exit the reception hall.
- The bell jar system will ensure that at no time are the bunker area doors and a reception hall door open at the same time, optimising the efficiency of the odour abatement system by minimising the total building volumes from which air will be extracted and compartmentalising the bunker solids storage bunker for odour control purposes.

Two dedicated overhead gantry cranes will be used to mix and load solid wastes deposited in the solids bunker. The overhead cranes will feed one of two pre-shredders located to either side of the solids bunker.

Solid feedstock will be conveyed from the shredder to a bio-mixers. The shredder will tear apart the solid feedstock breaking it into smaller particle sizes. Solid feedstock will be diluted within the bio-mixer with process water to facilitate pumping to the primary digestion tanks.

3.4.5 Liquid Feedstock Handling

All liquid feedstocks will be accepted in the liquids reception building which is described in Section 3.3.5. Incoming liquid farmyard manures (LFYM) tankers will enter the liquids reception building via one of four rapid roller doors. Each roller door will allow entry into a single liquids reception lane. Each lane will contain two spigot valve connection points. A robotic arm from the specialised articulated vacuum will connect to the infeed spigot. Once connected, LFYMs will be pumped from the tanker into the liquids pre-storage tank located in the bunded tank farm.

Once all LFYM is unloaded from the tanker the robotic arm will disconnect from the liquid intake spigot and connect to the liquid digestate offtake spigot. Once connected, loading of liquid digestate will commence. The liquid feedstock intake spigot and digestate offtake spigot will be located immediately adjacent each other. A system of non-return valves will ensure that there is no possibility of LFYM being pumped to the Digestate Storage Tank or LFYM being loaded into the vacuum tanker. Once fully loaded with digestate tankers will exit the liquids reception building via the rear doors.

The liquid infeed pumping system will include a fine cut macerator unit to reduce wear within the process and to remove foreign bodies/contaminant e.g. stones, grit from the liquid feedstocks. Liquid pre-storage tanks will be continually mixed to ensure the LFYMs received remain in suspension.

Liquid feedstocks will be pumped from the pre storage tanks to the primary digestion tanks via a set of heat exchangers. Heat exchangers will raise the liquid feedstock temperature from its, ambient temperature to just above the thermophilic process temperature range (i.e. 48-55°C). The liquid feedstock will be heated to above the process temperature range to account for heat losses due to the introduction of the ambient temperature solid feedstocks into the primary digester.

3.4.6 Primary Digestion

The primary digestion phase will be undertaken in the six primary digestion tanks. Primary digestion tanks will operate in two parallel groups of three tanks in series.



The primary digestion phase is the main stage of biogas production. Each primary digester will operate within a thermophilic environment of 48-55°C. The digesters will operate as continuously stirred tank reactors (CSTRs). Mixing of the digesters contents is by one central top mounted agitator on the tank's roof.

Digestate discharge from each primary digester to the secondary digester will be facilitated by a cavity pump through a pipe situated at the bottom of the digester.

Tanks will be equipped with over/under pressure valves for safety. The valves will be dimensioned according to the gas production for the respective tank +100%. To prevent liquid overflow from the tanks, multiple level measurements will be installed in the tanks.

3.4.7 Secondary Digestion

The secondary digestion phase will be undertaken in the three secondary digestion tanks. Secondary digestion uses the same type of tank and follows the same process as outlined in the primary digestion Section 3.4.6, operating in the same thermophilic environment of 48-55°C. Digestate discharge from secondary digester to the tertiary digester will be facilitated by a cavity pump through a pipe situated at the bottom of the digester.

3.4.8 Tertiary Digestion

Paddle mixers or submerged agitators will continually mix feedstocks within the tertiary digestion tanks operating in the same thermophilic environment of 48-55°C.

Total retention time for the entire digestion process (i.e. primary, secondary and tertiary) will average 58-60 days.

3.4.9 Hygienisation/Pasteurisation

Post digestion all digestate will be pastuerised in accordance with the European Union (Animal By-Products) Regulations 2014 Refer to Section 1.5.4 in Chapter 1 of this EIAR.

Digestate will be pumped into one of three pasteurization tanks, where it will be retained for >60 minutes at a temperature >70°C. The three tanks will operate on a rotational/batch basis, each serving a specific function: one for receiving the digestate, one for holding it, and one for pumping it to the downstream digestate storage. This rotation cycle shifts after the required 60 minutes minimum temperature hold time has been achieved.

Similar to the digesters, these pasteurization tanks are heated reactors, maintaining a temperature of >70°C via overheating ($\geq 2^\circ\text{C}$) of the incoming stream in external heat exchangers. The pasteurisation tanks shall be equipped with several temperature transmitters, to monitor that the required temperature is maintained throughout the tanks, minimum 3 at different levels of the tank. An alarm is required in case the material falls to or under 70°C at any time of the minimum required 1-hour cycle. If the required temperature is not met as measured at any of the installed sensors for the time required an alarm notification will be raised and an event recorded. The pasteurisation process will restart automatically.

The tanks will be installed with SCADA systems that ensure that tank material is only released when the temperature has met at all temperature transmitters. The SCADA system will be non by-passable meaning it cannot be accessed and changed by operating personnel.



The pasteurisation tanks will be insulated to reduce heat demand. After the pasteurisation tanks, the digestate will be separated into a solid and liquid fraction in the loft of the solid digestion storage building. (See Section 3.3.6.3)

3.4.10 Digestate Storage

A total of 4 days liquid digestate storage will be available onsite in the post digestion Liquid Digestate Storage Tank and a total of 4 days solid digestate storage will be available onsite in the Solid Digestate Building.

3.4.10.1 *Solid Digestate*

Post digestion the spent feedstock mix called digestate will be separated into liquid digestate and solid digestate. Separation will be carried out by screw press separation. The screw press separators will be located in elevated loft area within the Solid Digestate Building. Solid digestate will be conveyed away from the screw presses and dropped to the floor of the solids digestate building. The conveyor system will be able to operate in automatic mode controlling the placement of digestate in a stockpile with an average height of 4.5m. A wheel loader will transfer solid digestate into tipper haulage trucks waiting in the loading lane.

Covered articulated or fixed body tipper trailers will enter the solids digestate building via a rapid roller shutter door. The digestate loading area will be physically separated from the digestate storage area by a 1m stub wall to maintain physical separation, limiting transfer of solid digestate into the loading area. The loading area will be regularly cleaned of any solid digestate accidentally spilled during loading operations. Hot power washing equipment will also be immediately available within the loading area. Drivers will undertake hot washdown operations immediately after loading. Once fully loaded, drivers will exit via opposing rapid roller shutter door.

Solid digestate will be returned to the supplier farms, tillage farms and contract spreaders as an organic fertiliser/soil conditioner. (See Section 0)

3.4.10.2 *Liquid Digestate*

Liquid digestate will be returned to one of the post digestion liquid digestate storage tank located in the bunded tank farm.

Liquid digestate will be pumped from the post digestion liquid digestate storage tank to the digestate loading tank located beside the liquid reception building. Liquid digestate will be pumped from this loading tank to an articulated vacuum tanker. The articulated vacuum tankers having first unloaded their liquid feedstock as described in Section 3.3.5 will undergo a wash down procedure. Once fully unloaded of feedstock and externally washed down, the robotic arm will disconnect from the liquid intake spigot and connect to the liquid digestate offtake spigot within the same liquids reception building. The liquid feedstock intake spigot and digestate offtake spigot will be located immediately adjacent to each other, such that the articulated vacuum tanker does not need to move from its unloading/loading position within the liquids reception building. Liquid digestate will be returned to the supplier farm as an organic fertiliser. See Section 0.

3.4.11 Drainage Infrastructure

The site drainage strategy is designed to segregate water streams based on their origin and potential contamination risk, ensuring that all water is either recovered for reuse within the process or treated safely to remove contamination.



It is calculated the water consumption of the facility significantly exceeds the projected total volume of storm water and rainwater collected on-site. Therefore, there is no requirement under normal operations to discharge water off-site. In the unlikely event of contamination within the storm water lagoon, the contents will be contained, removed via tanker, and transported to an authorised wastewater treatment facility.

The estimate process water usage will be 62,000 m³/year (170 m³/day) sourced from rainwater harvesting onsite (65-130 m³/day (Avg. Monthly)) and the proposed groundwater well (100-120 m³/day (Avg. Monthly)). The proposed drainage infrastructure, storm water and process water infrastructure and operation is described in Section 3.3.17.

The operation of the system is Summarised in Figure 3-23.



Drainage Infrastructure – Engineering Overview

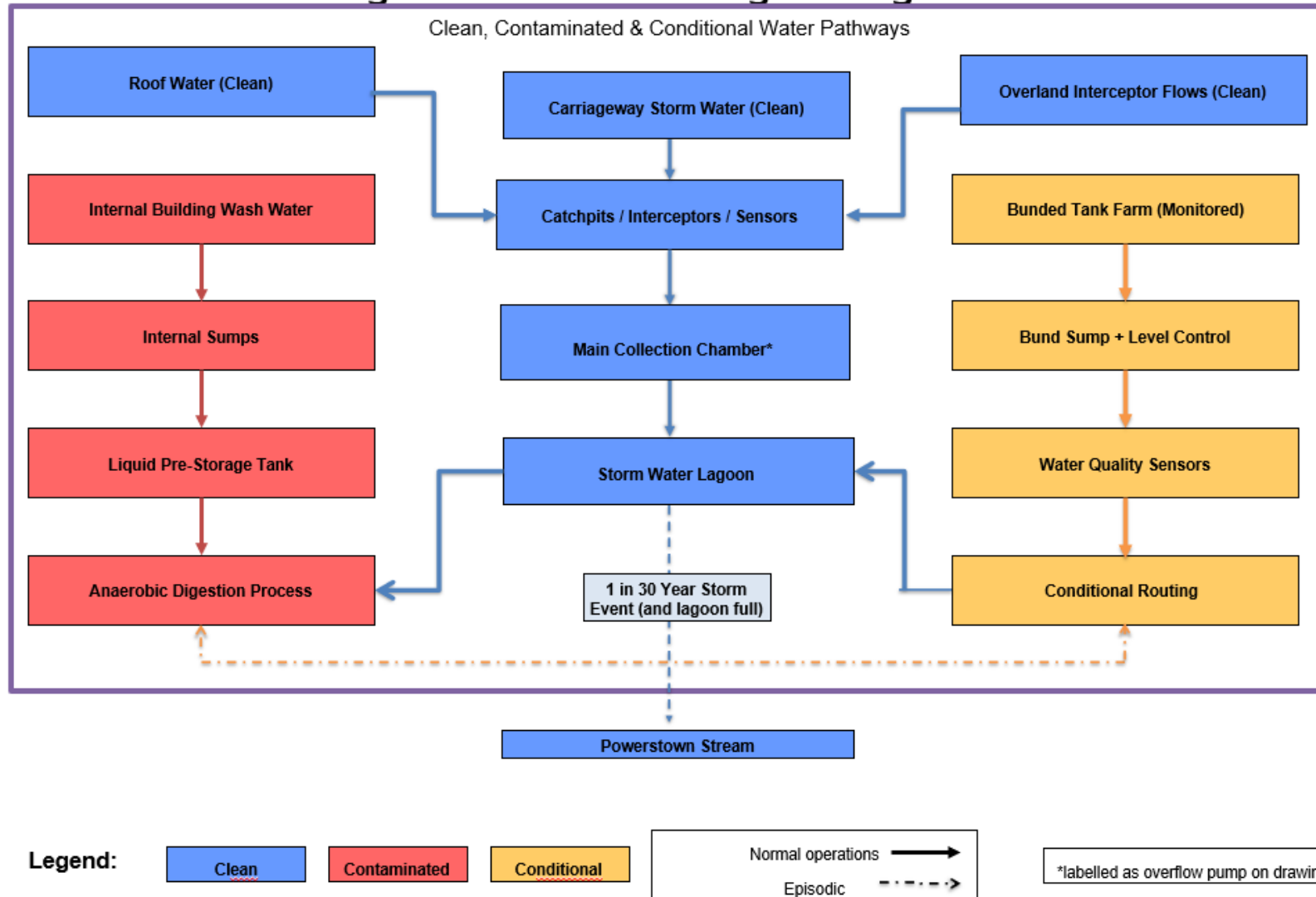


Figure 3-23: Proposed Water Management Systems



3.4.11.1 Water Collection Areas

Bunded Tank Farm

Rainwater accumulating within the tank farm bund drains via gravity to two dedicated storm water sumps located in the southern side of the bunded tank farm area. From here, the water is pumped directly to the storm water lagoon. The pumping of this water is controlled by autonomous level monitoring and is strictly governed by Continuous Emission Monitoring (CEM) system to ensure quality control, preventing contaminated water being pumped to the storm water lagoon.

The stormwater will be conveyed via a dedicated pumped system into the storm water lagoon:

- The pumped system will also be fitted with water-quality sensors to continuously monitor runoff collected within bunded areas.
- Where contamination is detected, the pump will automatically prevent discharge to the stormwater lagoon, ensuring isolation of potentially contaminated water within the bund.

In the unlikely event of contamination, water will be tankered off site.

Roof Area

Rainwater from building roofs, which is deemed uncontaminated, drains via a separate rainfall collection gulley network on each building which flows to a separate drainage network under the yard area which connects to the main collection chamber⁹.

- Roof runoff will be conveyed through catchpits with sumps, allowing settlement of debris and fine particulates and providing access for inspection and maintenance.
- As roof water is uncontaminated, no hydrocarbon interception is required; however, the inclusion of catchpits provides additional resilience and operational control.
- Roof water will discharge to the storm water lagoon, contributing to overall flow balancing and attenuation.

Yard and Circulation Areas

Storm water from the internal road network and circulation areas is collected via a gravity-fed drainage network to a Class 1 Full Retention Interceptor, which alerts of any potential hydrocarbon spills, such as oil, diesel, or petrol a. It is then drained to the main collection chamber as it is deemed uncontaminated.

Once the rainwater from the roof and the storm water from the yard reaches the main collection chamber, water is pumped to the stormwater lagoon. From there it is pumped back to the process water tanks to be used as supply for the facility.

- Runoff from plant carriageways and circulation areas will be collected via gullies, eco-drains and drainage kerbs incorporating sumps, providing primary sediment control at source.
- Flows will discharge into TII-specified catchpits with a minimum sump depth of 300 mm, providing secondary sediment settlement.

⁹ Referred to as overflow pump chamber on drawing



- A Class 1 Full Retention petrol/oil interceptor, designed in accordance with TII specifications, will be installed to remove hydrocarbons from runoff generated in trafficked and operational areas.
- The plant drainage network will be equipped with water-quality sensors designed to continuously monitor the characteristics of water collected within the system.
- Penstocks will be installed downstream of the interceptor and upstream of the lagoon .
 - Under normal operating conditions, uncontaminated runoff will be permitted to pass through the drainage network.
 - In the event that CEM indicate the presence of contamination or a spillage, the penstocks will automatically close to prevent discharge to the lagoon.
 - Contaminated runoff will instead be automatically diverted to the dedicated spillage containment system, thereby ensuring full isolation of polluted flows from the wider drainage system.
- A dedicated spillage containment system with a minimum capacity of 50 m³ will be provided to retain large spillages. This system will be located at a lower level than the drainage network to prevent reverse flows and to facilitate safe recovery and removal of contaminated material off site to an appropriately licensed facility.

This combination of continuous monitoring, automatic isolation, and controlled diversion provides an active and fail-safe layer of protection against accidental pollution.

Interceptor Drainage Network

Overland flows from the surrounding lands and the existing quarry cut will be intercepted downslope of the operational areas via a dedicated interceptor drainage system. It will primarily comprise of vegetated swales, designed to reduce flow velocities and promote sediment settlement. Check dams will be installed at regular intervals along the swales to:

- reduce runoff velocities
- increase hydraulic residence time
- promote settlement of suspended solids
- improve water quality prior to discharge

Where space constraints prevent the use of swales, filter drains will be provided as an alternative interceptor element. Interceptor drainage flows will discharge to the lagoon via the main collection chamber.

Internal Building Drainage

Drainage from internal operational areas (the Liquids Reception Building, Solid Reception Building, and Solid Storage Building) is separated from the external storm water networks. Wash water from these buildings is collected via a dedicated internal drainage network leading to specific dedicated sumps. This water is pumped to the Liquid Pre-Storage Tank, where it is used as process water for the anaerobic digestion process and ultimately pasteurised.

Foul Water

Foul water generated from the administration building and site welfare facilities (located in the liquid reception building and the heating centre) is managed independently. It drains to sealed underground storage tanks. These tanks will be automatically monitored and periodically emptied by a licensed waste contractor via tanker for off-site treatment at a private licensed wastewater facility. The Applicant has received letters of support from private wastewater contractors to provide treatment capacity for the foul water.

See Appendix 3.3 in Volume 3 of this EIAR.



3.4.11.2 Water Storage Areas

Process Water Tanks

The Process Water Tanks, which supply the site's operations, are filled using recovered water from the storm water lagoon and the main collection sump, supplemented by the site's groundwater well.

Storm water Lagoon

As described in Section 3.3.17.4, there is an engineering stormwater lagoon on site for the management of clean storm water. In the scenario where the storm water lagoon is at capacity, the process water tanks are at capacity and there is a one in 30 year storm event, clean excess water will be discharged to the existing drainage system in the R448 that flows to Powerstown Stream at greenfield rates over a 24 hour period.

- Clean water from the plant carriageway areas, roof areas and overland flow is attenuated in the covered sealed stormwater lagoon.
- A forebay will be provided at the lagoon inlet to manage first-flush runoff and capture residual sediment.
- The lagoon will include a settling zone, sufficient storage volume, and a minimum freeboard of 300 mm.
- It will be designed for the 1-in-30-year storm event plus 20 % climate change allowance.
- Due to the quarry setting, the lagoon will operate as a drainless system, with exceedance flows managed by pumping.
- Pumping of exceedance flows will be restricted to the greenfield runoff rate for the combined tributary catchments and will be controlled such that the total exceedance volume is discharged gradually over a minimum period of 24 hours (minimum retention time) recommended to the TII specifications or best practice, ensuring:
 - prevention of sudden downstream flooding;
 - replication of greenfield runoff behaviour; and
 - enhanced sedimentation and water-quality improvement prior to discharge.
- The pump station associated with the lagoon will be equipped with water-quality sensors designed to continuously monitor lagoon water prior to pumping exceedance flows.
 - Pumping of exceedance flows will only occur where monitoring confirms acceptable water quality in accordance with conditions set by the IE licence from the EPA.
 - Where monitored parameters indicate contamination or abnormal conditions, the pump system will automatically inhibit discharge, ensuring retention of potentially contaminated water within the lagoon for further treatment and management.

These integrated, multi-stage and actively controlled design measures provide a robust, fail-safe approach to storm water management and significantly reduce the likelihood of adverse impacts on surface water quality, hydrological regimes, and downstream receptors.

3.4.12 Biogas Management

Methane generated will be captured and conveyed to the gas grid. Gas storage will be included on top of reinforced concrete tanks in domes. The gas system will be designed to ensure that the gas flows in the correct direction, meaning support blowers will be installed where relevant.

There will be flow meters on the individual process tanks (primary, secondary and tertiary).



3.4.13 Biogas Treatment

Raw biogas will be collected from all primary digestion, secondary digestion, tertiary digestion and post storage tanks for upgrading to biomethane and biogenic CO₂. The raw biogas will first undergo a gas conditioning process which includes the compression and chilling of the gas. The chilling or cooling of the warm gas leads to the formation of a liquid condensate which will be pumped to the Liquid Pre-Storage Tank. Following biogas treatment, conditioning and upgrading, the biomethane must meet quality requirements for the national gas grid which are set out in Table 3-9.

Table 3-7: Proposed Raw Biogas Process Design Parameters

Parameter	Range	Unit
Pressure (mbar)	2-5	mbar
Temperature	20 - 55	°C
CH ₄	50 - 62	% v/v
CO ₂	38 - 50	% v/v
O ₂	0.3 - 0.5*	% v/v
H ₂ S	desulphurised 0 – 100/200	ppm

*after oxygen injection

3.4.14 Desulphurisation

The biogas will go through a two-step desulphurisation process to remove hydrogen sulphide within the desulphurisation plant. The first step will be a biological process. The biogas will pass upwards through a vertical column where sulphur oxidising bacteria will feed on the hydrogen sulphide available within the raw biogas. At the same time that raw biogas is moving upward, a mixture of process water and NPK fertiliser will be allowed to trickle downwards to both support bacterial growth and flush out the excreted byproducts of the bacteria. This will generate a product known as condensate. Condensate will be pumped from the base of the gas column to the digestate tank. This biological cleaning step will reduce hydrogen sulphide concentrations.

3.4.15 Granulated Activated Carbon Filtration

Post conditioning, the raw biogas will pass through a granulated activated carbon (GAC) filter for the removal of Hydrogen Sulphides (H₂S), VOCs and other trace contaminants. Activated carbon filtration removes hydrogen sulphide by adsorbing it onto the surface of porous carbon media. The raw biogas is drawn through the tower containing granular activated carbon with a very high internal surface area. As the raw biogas passes through the carbon bed, hydrogen sulphide and volatile organic compounds (VOCs) are physically and chemically bound to the carbon surface. Carbon media is replaced or regenerated once adsorption capacity is exhausted.

3.4.16 Gas Upgrading

The upgrading process will separate the desulphurised raw biogas mixture into biomethane (CH₄) and biogenic carbon dioxide (biogenic CO₂).

Biogenic CO₂ is CO₂ derived and captured for utilisation from carbon previously absorbed and stored within organic matter.



The desulphurised raw biogas is passed through an amine solution within an absorber tower. Acidic gases (e.g. CO₂ and trace H₂S) are physically absorbed into the amine solution in the absorber tower forming an amine solution. Methane being a non-acidic hydrocarbon does not react with the amine solution and thus remains in the gas phase allowing for its collection as a purified biomethane product. The amine solution (containing the acidic gases) is transferred to a stripper tower, where it is heated to its boiling point (105 °c @ approx. 70 mbar(g) and 84°C @ approx. -500 mbar(g) depending on stripper pressure design) to regenerate the amine, releasing biogenic CO₂ and any remaining H₂S impurities for separate collection. The regenerated amine is then recycled via a cooling chamber back to the absorber. Heat is provided by means of hot water or steam generated at the Heating Centre.

Typical amine solutions are Diethanolamine (DEA), Monoethanolamine (MEA) or Methyldiethanolamine (MDEA), or a mix.

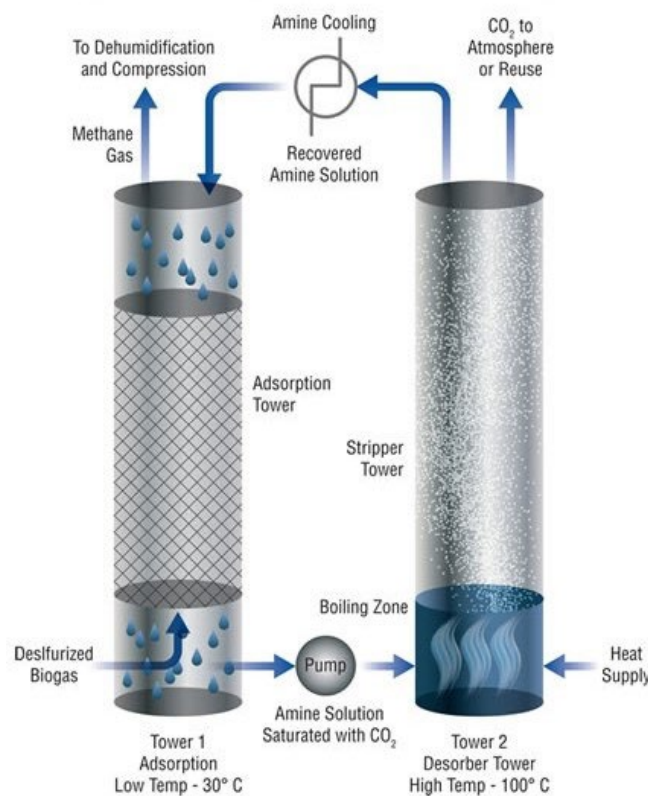


Figure 3-24: Amine Separator Illustration (Atmos Power, 2026)

3.4.17 CO₂ Liquefaction

Biogenic CO₂ then undergoes CO₂ liquefaction, it is compressed and cooled forming liquid CO₂. This liquid CO₂ is stored in insulated tanks for transport offsite as a food grade CO₂ product. The proposed Liquefied CO₂ Quality Parameters are set out in Table 3-8.

The raw biogenic CO₂ (separated by the Biogas Upgrading Plant) will contain impurities like moisture, sulphur compounds, and trace hydrocarbons. The raw gas will first undergo purification using molecular sieves, activated carbon filters, and chemical scrubbers.



Next, the purified biogenic CO₂ gas will be compressed in multistage compressors, raising its pressure to around 15–25 bar. Intercoolers between each compression stage will remove excess heat. The compressed gas is then pre-cooled to near 0°C using chillers or heat exchangers. The core liquefaction phase involves cooling the biogenic CO₂ below its critical temperature (around -20°C) under pressure using cryogenic heat exchangers and refrigerants (ammonia). This condenses the gas into a dense liquid.

The final liquid CO₂ will be stored in vacuum-insulated pressure vessels. Specialist trucks will be then used to transport the liquefied biogenic CO₂ offsite for sale as a product in Ireland and abroad. Trucks will be filled using one of two dedicated CO₂ filling points.

Table 3-8: Proposed Liquefied CO₂ Quality Parameters*

Parameter	Requirement	Unit
Carbon Dioxide (CO ₂)	>99.9	% v/v
Water (H ₂ O)	<20	ppmv
Oxygen (O ₂)	<30	ppmv
Carbon Monoxide (CO)	<10	ppmv
Ammonia (NH ₃)	<2.5	ppmv
Total Sulphur (Total S)	<0.5	ppmv

Food and beverage level quality. Source: Carbon dioxide food and beverages grade, source qualifications, quality standards and verification, EIGA Doc 70/17.

3.4.18 Biomethane Grid Entry Facility (BNEF)

Biomethane will enter the BNEF from the Gas Upgrade Plant (See Section 3.4.16). The BNEF will continually monitor the biomethane produced against GNI network standards. The general gas parameters will be continually analysed within the BNEF as set out in Table 3-9.

Biomethane meeting the required quality parameter will be metered and allowed entry the gas transmission network as Renewable Natural Gas.

In the event that the biomethane produce fails to meet the required standard the gas transmission network valve will close and the rejected biomethane will be returned to the digestion plant via an internal gas return loop. The rejected biomethane will be then either reprocessed (re-entering as raw biogas i.e. to the desulphurisation plant) or flared (See Section 3.3.15) until such time that the GNI quality parameters are met and the network valve "reopens".

GNI are responsible for development of proposed gas pipeline to convey gas from the BNEF to the GNI AGI located in Clogrennan (at Clogrennane Lime Works) (See Section 3.3.20). The BNEF will continually measure and monitor the biomethane produced on site to ensure it meets the RNG requirements classification. The required RNG grid entry quality requirements are set out in Table 3-9.



Table 3-9: GNI RNG Grid Entry Quality Requirements

Parameter	Entry Requirements	Units
Total Sulphur	< 50 mg/m ³ (including H ₂ S)	mg/m ³ (including H ₂ S)
Oxygen	≤ 0.2 mol% see RNG note 1	mol%
Carbon Dioxide	≤ 2.5 mol% See note 1	mol% See Note 1
Hydrogen Sulphide	≤ 5 mg/m ³	mg/m ³
Water Content	≤ 50 mg/m ³	mg/m ³
Gross Calorific Value (Real Gross Dry)	36.9 – 42.3	MJ/m ³
Wobbe Index (Real Gross Dry)	47.2 – 51.41	MJ/ m ³
Contaminants and Odor	See Note 2 and 3	
Incomplete combustion factor	< 0.48	
Delivery Temperature	1- 38	°C
Hydrogen	< 0.1 mol%	mol%
Soot Index	< 0.60	
Organo Halides	< 1.5 mg/m ³	mg/m ³
Radioactivity	< 5 Becquerels/g	Becquerels/g
Ethane	< 12 mol%	mol%
Nitrogen	≤ 5 mol%	mol%
Hydrocarbon Dewpoint	≤ -2°C up to 85 barg	

Reference Conditions

All measurements at 15° Celsius and 101.325kPa

Note 1 The CO₂ limit of 2.5% will not be considered breached if the total inerts (including CO₂) in the gas is less than 8% where: "inerts" in natural gas means carbon dioxide (CO₂), nitrogen (N₂), helium (He), argon (Ar), and oxygen (O₂).

Note 2 Natural Gas shall not contain solid liquid or gaseous material which may interfere with the integrity or operation of pipes or any Natural Gas appliance which a consumer or transporter could reasonably be expected to operate. With respect to Mist, Dust, Liquid, gas delivered shall be technically free in accordance with BS3156 11.0 [1998].

Note 3 Natural Gas shall have no odour that might contravene the obligation of the Transporter to transmit gas which possesses a distinctive and characteristic odour. Where the Transporter requires gas to be odourised, the gas shall be odourised in accordance with the following specification:

- Odour intensity of 2 olfactory degrees on the SALES Scale (Ref-IGE/SR/16/1989), or
- such other specification determined by the Transporter acting as an RPO

Emergency Gas Quality Specification In the event of an Emergency, and at the sole discretion of the National Gas Emergency Manager, gas outside of the Entry Specification may be admitted to the system. Without prejudice to the generality of this, the emergency limits as outlined in the Natural Gas Emergency Plan NGEP may be adopted by the Transporter.



Renewable Natural Gas Notes

1. Oxygen content for gas derived from Renewable Natural Gas at an RNG Entry Point connected to the Distribution System shall be up to **1 mol%** where there is provision for automatic discontinuation of gas flows for non-compliance with the applicable Entry Specification. Such automatic discontinuation shall comprise of the discontinuation of gas flow based on preprogrammed criteria, such criteria determined by the Transporter and embodied in an automated process, all as outlined in the applicable CSA.
2. The CSA in respect of any RNG Delivery Facility may subject to the approval of the Commission specify additional gas quality parameters (which may for avoidance of doubt be subsets of the parameters set out above) and associated limits in respect of such parameters to apply at the individual RNG Entry Point or category of RNG Entry Point in which case the gas quality parameters so specified shall (subject to Renewable Natural Gas Note 1 above) apply at such RNG Entry Point(s) in addition to the parameters set out above.

3.4.19 Gas Flares

There are two gas flares on site to manage biomethane in the event that it cannot be transferred to the grid. They are enclosed gas flares which will combust methane at $>850^{\circ}\text{C}$ for 5 seconds retention time to ensure conversion of methane to carbon dioxide. The operation of these flares will be conditioned by the IE licence with annual testing. The flares will be run periodically as part of the maintenance schedule which is estimated at 200 hours. Digestate Management

3.4.19.1 Digestate Product

As per Chapter 2 (Waste Framework Directive) the anaerobic digestion of manures generates a waste product. The Applicant has identified two routes to achieve end of waste status:

Route 1

The digestate will comply with the EU Fertiliser Product Regulations 2019 (Regulation (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019 laying down rules on the making available on the market of EU fertilising products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003) (EU FPR). Article 19 of this regulation states “This Regulation lays down criteria in accordance with which material that constitutes waste, as defined in Directive 2008/98/EC, can cease to be waste, if it is contained in a compliant EU fertilising product. In such cases, the recovery operation under this Regulation will be performed before the material ceases to be waste, and the material shall be considered to comply with the conditions laid down in Article 6 of that Directive and therefore to have ceased to be waste from the moment that the EU declaration of conformity was drawn up”.

Route 2

The applicant will seek a licence condition (under EPA IE licence) as per the following condition in other AD licences recently granted, e.g. condition 8.15

“8.15 Quality of digestate (soil improver)

8.15.1 Digestate must comply with the requirements of the EU Fertilising Products Regulation (EU) 2019/1009 and the quality standard as set out in Schedule E: Standards for Digestate Quality of this licence or an alternative quality standard as approved by the Agency.

8.15.2 Treated waste that fails to meet the requirements of Condition 8.15.1-, must be either be reused in the process or treated as waste.



8.1-5.3 Treated bio-waste that fails to meet the quality standard for digestate as set out in Table E.2-L Maximum Metal Concentration Limits of schedule E: Standards for Digestate Quality of this licence must be handled as waste and must not be reused in the process.”

3.4.19.2 *Proposed Digestate Management*

Digestate Management will comply with the commitments as outlined in the Biomethane Environmental Sustainability Charter, 2025.

In most cases, under the supplier contracts, the feedstock supplier is responsible for the take back and management of the digestate¹⁰ in accordance with their responsibilities under the Nitrates Regulations. The beef sector will operate on the supply return agreement, as will the majority of the dairy sector. The pig and equine sector digestate will be managed by a contract land spreader on behalf of the Applicant and transported and spread on tillage or grasslands in need of the fertilising benefits and in line with their current spreading arrangements. Digestate will be returned to the duck and poultry spreadlands as per existing arrangements. The existing management of feedstock is described in Section 3.2.6.2.

Under the terms of contracts with the biogas facility the farmer/ feedstock supplier is responsible for the receiving back and the management of the digestate in accordance with their responsibilities under the Nitrates Regulations. Exceptions to this may be some livestock farmers from the poultry and equine sectors who may not have sufficient suitable land associated with their holding for the receipt of organic materials/digestate.

These farmers routinely export organic materials as standard practice to other farm holdings in accordance with the Nitrates Regulations.

Surplus digestate will be managed by a contract land spreader appointed by the Applicant, with this digestate being transported to and spread on suitable tillage land or grassland in accordance with the Nitrates Regulations.

The closed spreading season is 16-20 weeks depending on location and 16 weeks in Carlow, therefore storage is required, as per existing practice by farmers for 230,000 t of digestate to cover an 18 week period. During the open season, as digestate is returned to farms, it will be land spread. Farms secured under letter of intent (LOI) within the effective catchment area of 35km radius of the proposed development have storage capacity for all digestate produced during the closed season.

3.4.19.3 *Spreading of Liquid and Solid Digestate*

Liquid digestates arising from the proposed development will be spread on lands belonging to the farmers supplying the plant with LFYM or by licensed landspreading contractors to farms where a nutrient demand exists e.g. tillage farms. All landspreading activities will be undertaken by farmers or their appointed contractors with the benefit of detailed Nutrient Management Plans (NMP) prepared in accordance with the Nitrates Regulations

The landbanks for landspreading will largely comprise arable lands in areas of Carlow, Kildare, Laois, Wexford and Kilkenny as per Table 3-2.

¹⁰ The supplier contracts include for digestate return typically calculated on a nutrient-to-nutrient basis (N to N or P to P), compensating for the increased concentration of key nutrients in the digestate relative to the initial feedstock (depending on supplier, e.g. cattle slurry supplier will receive a more nutrient rich product, whilst the poultry supplier landbanks will receive a less concentrated product. Consequently, while the nutrient tonnage (N or P) returned will be equivalent to that supplied.



The landspreading activity is not included in the scope of this EIAR because it is regulated under separate regulations.

The recipients of the digestate have an obligation to comply with statutory regulations outside the remit of planning legislation but under the Nitrates Regulations the requirements of which are as described in Section 2.6 of this EIAR.

As outlined in Section 1.5.3 of this EIAR and in addition to requiring Planning Permission, the proposed development activity falls within the remit of the Industrial Emissions (IE) Directive (2010/75/EU), as implemented by the European Union (Industrial Emissions) Regulations (S.I. 138 of 2013), which amend the First Schedule of the 1992 EPA Act. As such, the applicant will submit an Industrial Emissions Directive (IE) licence application to the Environmental Protection Agency (EPA).

In accordance with Section 99F of the Environmental Protection Agency Act 1992 (as amended) and Section 54 of the Waste Management Act 1996 (as amended), no conditions controlling emissions from the operation of the proposed activity, including the prevention, limitation, elimination, abatement or reduction of those emissions, or controlling emissions related to or following the cessation of the operation of the activity may be imposed by the planning authority. That is because those matters are determined by the EPA through the IE Licensing process.

3.4.20 Odour Management

Please refer to Section 3.3.8.

3.4.21 Commissioning and Maintenance

The proposed development will be commissioned in accordance with construction contracts and to comply with the IE licence. Commissioning will take place on a phased basis as components are completed.

3.4.22 Emergency Response

The IE licence will require an Emergency Response Plan (ERP) and procedures. An outline ERP is included in the CEMP in Appendix 3.1 of Volume 3 of this EIAR. Potential emergency situations that could arise during construction, operation or decommissioning of the proposed development will be included in the ERP e.g.:

- Fire
- Explosion
- Flood
- Environmental Pollution
- Severe Weather Event
- Health and Safety -Major Accident

The plan will make provision for:

- emergency response liaison and reporting
- procedure for reporting emergencies and raising the alarm
- designated responder and medical protocol



- location and contact information for the nearest Emergency (A&E) facilities including:
 - accident & emergency (A&E)
 - ambulance service
 - fire services
 - local Garda Station, district and divisional headquarters
- escape and evacuation procedure
- prevention of illness/injury of site staff due to weather and elements
- environmental emergency procedure
- fire-fighting water supply and firewater management

3.4.23 Operational Consents

Refer to Chapter 1 for detail on operational consents.

3.5 Construction Methodology Proposed Development

The following section outlines the proposed construction methodology for the main construction elements of the proposed development.

The key construction elements (listed in chronological construction order) are as follows:

- Advanced Works (site clearance), Site Entrances, and Contractors Compound
- Storm Water Management
- Earthworks
- Solids Reception Building
- Liquids Reception Building
- Solid Digestate Building
- Circulation Yard
- Bunded Tank Farm
- Desulphurisation Plant
- Gas Upgrade Plant
- CO₂ Liquefaction Plant
- Heating Centre
- Biomethane Network Entry Facility
- Administration Building
- Weighbridge and Weighbridge Office
- Mechanical and Electrical

The construction timeline and works sequencing is discussed in Section 3.5.1.

The construction methodology for the proposed gas network connection is detailed in Section 3.6.



3.5.1 Preliminary Construction Programme

The proposed construction timeline is 24 months as shown in Table 3-10.

3.5.1.1 *Construction Working Hours*

The proposed hours of construction are:

- Daytime (07:00 – 18:00)
- Saturdays (08:00 – 14:00)
- No construction Sundays or bank holidays



Table 3-10: Construction Timeline

Activity	Month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Weighbridge																								
Stormwater Lagoon - Earthworks																								
Yard Area																								
Solid Waste Reception Building																								
Liquid Reception Building																								
Solid Digestate Building																								
Heating Centre																								
Primary Digester																								
Secondary Digester																								
Tertiary Digester																								
Digestate Storage																								
Pasteurisation																								
Tank Farm Base																								
De-sulphurisation plant																								
CO ₂ Liquefaction Plant																								
Gas Upgrade Plant																								
Odour Unit																								
Admin Building																								
ESB sub station																								
Car park																								
Gas Flare																								
Solar Panels																								
Site Staff																								

Note: B* – Building, P* - Plant



3.5.2 Construction Traffic: Proposed Development

The construction of the proposed development will generate construction-related traffic on the roads in the proximity of the development. It will include:

- site personnel driving to the work site/construction compound (by car, van and 4x4)
- delivery of materials, tanks, prefabricated units steel, cladding and other construction materials by van and HGV
- movement of construction equipment and refuelling trucks to and around the site export of excess excavated soils
- import of engineering fill material and concrete

A Traffic Management Plan has been prepared and will be updated by the contractor prior to the commencement of the construction work for inclusion in the Construction Environmental Management Plan (CEMP) in Appendix 3.1 of Volume 3 of this EIAR. The plan will be prepared in consultation with Carlow County Council roads department. Written procedures will also be put in place to deal with refuelling machinery in line with best practice.

3.5.3 Environmental Management during Construction

A Construction Environmental Management Plan (CEMP) has been prepared and is included in Appendix 3-1 of Volume 3 of this EIAR. It specifies environmental controls that the Contractor will be required to undertake during the construction phase. The Contractor will be required to update the CEMP for approval to commence construction. Please refer to the CEMP for:

- storm water management and sediment control during construction
- management of noise
- management of earthworks, concrete works and handling of fuels, chemicals and materials
- traffic management
- emergency response
- dust management
- resources and waste materials management
- health and safety during construction

3.5.4 Advanced Works, Site Entrances and Contractors Compound

Advanced site works will be required prior to full site mobilisation and will include general clearance of the site area, construction of storm water settlement lagoons, site entrances and establishment of construction stage site services e.g. generators, temporary potable water supplies and storage areas. Daily visual inspections of all settlement lagoons will be carried out with checks twice daily during periods of heavy rainfall. The stormwater lagoon will be one of the first pieces of infrastructure constructed on site.

A construction compound will be required for the duration of the construction cycles. It will typically consist of a hardcore area surrounded by secure fencing, comprising site offices, canteen, toilet facilities, storerooms and staff parking areas. Fuel/oil storage areas will be bunded in accordance with best practice.



The temporary construction compound will be located within the red line boundary and will move to accommodate various elements of the build.

Temporary welfare facilities will be required for construction workers. These will consist of temporary 'portaloo' type chemical toilets located within the construction site compound. Advanced site works will be completed using track excavators for general clearance, articulated wheeled dumpers for earth movements, fixed body tipper trailers for the delivery of virgin aggregates, roller compactors for the formation and compaction of hardstanding areas and truck mounted cranes used for unloading site containers and support infrastructure.

3.5.5 Earthworks

The footprint of the site will be excavated to the necessary formation levels for construction. Excavated materials will be used onsite for reprofiling and embankment construction. Excess materials will be exported offsite for recovery/disposal as appropriate.

The volume of materials to be excavated, retained on site and exported are shown here:

- excavation and moved on site approx. 98,900 m³
- retained on site approx. 93,900 m³
- exported (excess materials) approx. 5,000 m³

Refer to Drawing No's: P24188-FT-XX-XX-DR-CE-0300-0303 in Volume 4 of this EIAR.

Excavation works (cutting and filling) will be undertaken by 360° excavators and tracked bulldozer. Internal soil movements will be completed using articulated dump truck with offsite removal of excess materials completed using rigid tipper lorries.

3.5.6 Storm water Lagoon

The storm water lagoon will be constructed as an earthwork embankment. The footprint will be excavated to the required depth and the grading of internal slopes to ensure structural stability. The subgrade will be prepared and cleared of sharp debris, a high-density 1mm LLDP primary liner will be installed and seam-welded to create an impermeable barrier. The lagoon will be integrated into the wider site infrastructure via a pipe network consisting of gravity-fed inlets from the tank farm sump and the main collection sump. Water collected during the construction phase will be used for construction. There will be no discharge of water from the stormwater lagoon during the construction phase. If required, water will be transported off site.

3.5.7 Storm Water Management During Construction Phase

The stormwater lagoon will be the first piece of infrastructure constructed on site. It is described in the following section.



3.5.7.1 Stormwater Lagoon

- During operation, all three hydraulic networks will discharge to a sealed lagoon, preventing infiltration to groundwater. During construction, all stormwater generated on site will discharge to the sealed lagoon.
- A forebay will be provided at the lagoon inlet to manage first-flush runoff and capture residual sediment.
- The lagoon will include a settling zone, sufficient storage volume, and a minimum freeboard of 300 mm.
- It will be designed for the 1-in-30-year storm event plus a 20% climate change allowance.
- Due to the quarry setting, the lagoon will operate as a drainless system, with exceedance flows managed by pumping during the operational phase. During construction, the lagoon will be emptied by tanker as required, ensuring that no stormwater is discharged from the site.
- A temporary version of the operational phase pump station associated with the lagoon will be equipped with water-quality sensors designed to continuously monitor lagoon water prior to reuse of stormwater as a construction water source. Reuse of stormwater will only occur where monitoring confirms acceptable water quality. Where monitored parameters indicate contamination or abnormal conditions, water will be tankered off site for further treatment and management at an authorised facility.
- During construction, mitigation will focus on controlling sediment mobilisation, managing temporary drainage arrangements, and preventing accidental pollution. The construction of the proposed development includes the construction of the drainage system. There will be no discharge of stormwater from the site during the construction phase. All stormwater generated on site will be directed to and contained within the lined stormwater lagoon for containment, settlement, reuse where appropriate, and tankering off site where required. Monitoring of stormwater within the lagoon will be undertaken to determine its suitability for reuse as a construction water supply.
- A temporary drainage treatment train will be implemented throughout the construction phase. Surface runoff generated within disturbed areas of the site will be collected and conveyed through a sequence of treatment measures comprising temporary interceptor drains, check dams, sediment traps, the stormwater lagoon forebay and the stormwater lagoon settlement zone prior to storage within the lagoon. The treatment train can be summarised as follows:
- Runoff → Temporary Interceptor Drains → Check Dams → Sediment Traps → Lagoon Forebay → Lagoon Settlement Zone
- This treatment sequence will progressively reduce flow velocities, promote sediment settlement, capture suspended solids at multiple stages and minimise the risk of polluted runoff entering the stormwater lagoon. The lagoon will provide the final stage of sediment settlement and water quality management prior to reuse on site or removal by tanker where required.
- The following measures will be implemented during construction:
- Phased construction of drainage infrastructure to ensure that permanent drainage and treatment features are operational at the earliest practicable stage. The stormwater lagoon will be constructed in advance of earthworks.
- Installation of temporary sediment control measures, including silt fences, sediment traps, settlement areas, and temporary interceptor drains with check dams.
- Protection of the stormwater lagoon from uncontrolled inflows and excessive sediment loading during early construction phases through the use of temporary diversion ditches, check dams and sediment-control measures.
- Discharge from the stormwater lagoon to sealed tankers for off-site treatment and disposal where water quality monitoring identifies contamination or where excess volumes require removal.



- Water will be treated through a sequence of drainage elements, including the temporary and permanent sediment-control measures described above. The lagoon will provide additional treatment through settlement within the forebay and settlement zone.
- All temporary drainage measures, including interceptor drains, check dams, sediment traps, settlement areas and the stormwater lagoon, will be inspected regularly and following significant rainfall events. Accumulated sediment will be removed as required to maintain the effectiveness of the drainage system and preserve available storage capacity.
- Construction activities will be planned with consideration of forecast weather conditions. Activities with an increased risk of sediment mobilisation may be modified, suspended or rescheduled during periods of prolonged or intense rainfall where necessary to minimise pollution risk.
- Management of excavations and exposed soils to minimise erosion, including temporary stabilisation where required.
- Temporary stockpiles of soil and excavated material will be located away from drainage features where practicable and managed to minimise erosion and sediment runoff. Additional protection measures will be implemented where required during periods of prolonged or intense rainfall.
- Storage of fuels, oils and chemicals in bunded, sealed and designated areas, with refuelling restricted to controlled locations.
- Provision of spill kits and training of construction personnel in spill response procedures.
- An emergency pollution response procedure will be implemented on site. In the event of a spill, leak or other pollution incident, the source will be isolated immediately, contaminated material will be contained and recovered, and any contaminated water will be removed from site by an authorised contractor for treatment and disposal at an appropriately authorised facility.
- Strict control of concrete works to prevent alkaline runoff. All concrete wash out water will be collected in a dedicated tank and transported off Site by a permitted contractor to an authorised private WWTP.
- No direct discharge of stormwater to groundwater, surface water bodies or off-site drainage systems will occur during the construction phase.
- Protection of watercourse crossings along the gas pipeline route, with works undertaken at existing culverts or bridges in accordance with Inland Fisheries Ireland (IFI) guidance and OPW.

3.5.8 Portal Frame Buildings

This section is applicable to the following structures:

- solids reception building including a solids bunker constructed from reinforced concrete and odour abatement
- liquids reception building including odour abatement
- solid digestate building including odour abatement
- heating centre
 - to include a biomass storage bunker. The storage bunker will be constructed from reinforced concrete utilising similar methods to that described for the solids bunker, See Section 1.4.3 for details.
 - The proposed biomass boiler and biomass boiler exhaust air treatment system will be prefabricated off site, delivered by truck to site and craned into place within the Heating Centre.



3.5.8.1 Foundations

Relevant to all portal frame buildings and the tank bund farm, the gas upgrade plant, the gas desulphurisation plant, the CO₂ liquification plant, the odour abatement area, the admin building and the gas flares area.

Prior to the construction, a grid of stone reinforced columns will be used to improve the strength, stiffness, bearing capacity and settlement characteristics of the existing ground at the site. Construction typically begins by penetrating the ground to the required depth using a vibrating probe. Penetration may be achieved by vibration alone or assisted by air or water jetting, depending on soil conditions.

Once the target depth is reached, graded crushed stone or gravel is introduced either from the ground surface (top-feed method) or through the probe (bottom-feed method). The stone is placed in stages, and at each stage the vibrating probe is partially withdrawn and reinserted to compact the stone laterally into the surrounding soil. This process forms a dense, cylindrical column of stone while simultaneously improving the confinement and density of the adjacent ground. The sequence is repeated until the column reaches ground level. See Figure 3-25.

The finished stone columns act as stiff inclusions that carry load, reduce settlement, and provide drainage paths that accelerate consolidation of soft soils under applied loads.

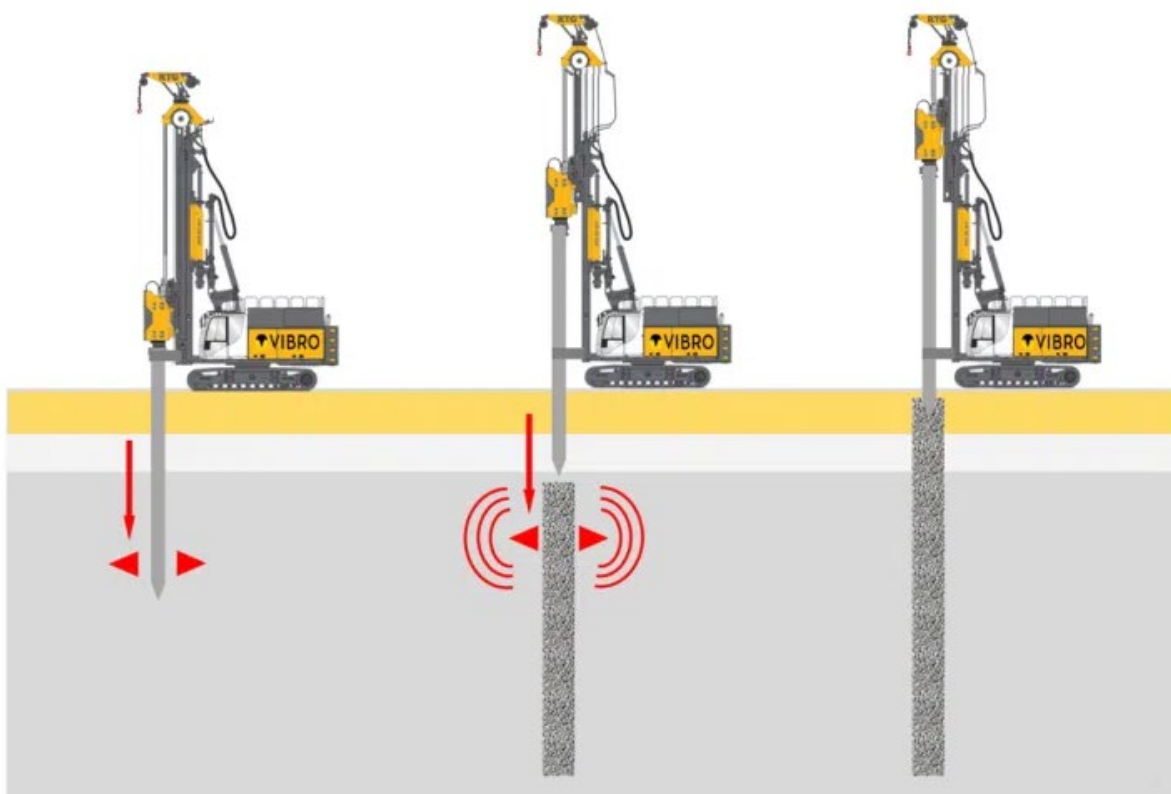


Figure 3-25: Vibro Stone Columns: Construction Sequence Schematic

All foundations will be ground bearing reinforced concrete pads/strips on a suitable stratum or stone column grid dependant on loading and settlement requirements.



3.5.8.2 *Preparation for and Management of Concrete Pour*

Hard standing formation will consist of hardcore on geo-textile membrane. The construction methodology for hard standings will be as follows:

- The formation will be prepared to receive the geotextile membrane.
- Stone (sourced locally from licensed quarries) will be placed and compacted in layers.
- Drainage ditches will be formed, within the excavated width and along the sides of the hard standing.

The extent of the excavation will be marked out.

Around the perimeter of the foundation formation a shallow interceptor drain will be formed and settlement pond / swale constructed.

The base of the foundations will be excavated to competent bearing strata. This will typically be within the upper 5 m but will be confirmed on-site by the Site Engineer.

Where necessary, temporary pumps and sumps may be required to maintain a dry, clean formation. Pumped water will be directed to the settlement ponds prior to entering the drainage system to the stormwater lagoon.

A layer of concrete blinding (lean mix) will be laid 75 mm thick directly on top of the newly exposed formation to provide a level platform.

Formwork and reinforcement will be fixed.

Ductwork will be installed as required for cables, and formwork erected around the steel cage.

Concrete will be placed using a concrete pump in accordance with the requirements of the Structural Engineer and compacted using vibrating poker.

Concrete would typically be in two pours, the first pour being the main base, which is approximately 90% of the foundation; the second and remaining 10% forming the plinth section which sits on the top of the main base.

Concrete foundations will be poured using a concrete pump feed by imported ready mixed concrete. Concrete will arrive to site in concrete mixing wagons which will empty to the concrete pump. Workers will direct the flow of pumped concrete as required and the concrete will be levelled in place by a suitable level machine or screed. See Figure 3-28.

Upon completion of the concreting works the foundation base will be covered against precipitation.

Steel shutters will be used to pour the upper plinth section.

Once the concrete is set the earthing system is put in place and the foundation is backfilled with suitable material to tie in with the required level of the hardstanding.

The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation.



3.5.8.3 Buildings

Imported structural fill will be a granular engineered fill, compacted to provide a suitable subgrade for the building floors. Floors will be constructed using steel or fibre reinforced concrete founded on a suitable depth of compacted granular fill. As per the foundations concrete will be pumped into place (See Figure 3-28) and suitably compacted. The floor finish will be achieved by a vibratory screed followed by steel power floats post initial curing.

The steel frame portal will be erected on the reinforced concrete substructure. The frame will consist of rolled steel columns and rafters typically at 5-7m spacing. Steel erectors will use a crane and typically two mobile elevated work platforms to construct the steel structure (See Figure 3-26). The crane will be used to lift and manoeuvre the steel elements as required. Workers on the elevated access platforms will then bolt the prefabricated members together forming the steel superstructure.

Cold rolled light gauge steel purlins and cladding rails will be fixed to the main columns and rafters. The frame will be cladded with insulated cladding.

The cladding will be appropriately detailed with flashings and seals to ensure maximum airtightness is achieved about the building envelope to maximise the efficiency of the odour abatement system.

For concrete walls, once the foundations are poured, rising walls will be constructed. These will be comprised of a mixture precast concrete walls and reinforced concrete “push walls”.

Precast concrete wall sections will be delivery to site prefabricated, the wall sections will be lifted into place by crane and suitably affixed to the building steel superstructure by structural connections.

Reinforced concrete walls will be constructed sectionally, reinforcement bars will be tied in place manually by steel fixers. Post completion of the reinforcement steel, metal formworks will be lifted into place by crane and will be suitably jointed and supported/propped in place. Imported Ready-mix concrete will be pumped into the construction formwork; vibratory pokers will be used to ensure the concrete is fully compacted and left to set. After a few days, the formwork will be stripped from the concrete walls to be reused in the proceeding sections.

Push walls will be designed to retain the weight of stockpiled material and the pushing forces associated with the operation of front-loading vehicles. Internal retaining walls will also be required in some buildings to accommodate the split-level nature of certain areas.



Figure 3-26: Steel erection: Crane and Mobile Elevated Work Platforms (Wall Steel, 2026)

Works to affix purlins and cladding will progress similarly to the erection of the steel structure by using a crane to lift and position materials and mobile elevated work platforms to allow workers fix materials as depicted in Figure 3-27.



Figure 3-27: Cladding Installation Portal Frame (Steel Construction Info, 2026)

External cladding will be affixed to the steel frame when completed. Roof drainage will consist of gutters and downpipes draining the pitched roofs to the storm water management system.



Figure 3-28: Placement of Reinforced Concrete Floors (Concrete Pumping Ltd., 2026)

3.5.9 Circulation Yard and Drainage Infrastructure

Refer to Section 3.5.8.2. The construction of the circulation yard and drainage will commence with excavation to the formation level. The area will be backfilled with a Class 6F1 sub-base material, laid and compacted to provide a stable foundation.

During this phase, the subsurface drainage network will be installed. This includes the placement of carrier pipes within the Class 6F1 layer, with vertical risers (up-pipes) positioned at designated collection points to interface with the surface drainage gullies.

Following the installation of services, a secondary layer of Class 804 granular material will be applied and blinded to provide a level sub-grade. The final structural layer will consist of reinforced concrete, incorporating steel mesh or bar reinforcement as per the structural design to accommodate heavy vehicular loading. The slab will be cast with a power-floated or brushed finish to ensure a durable, smooth, and slip-resistant surface. Upon completion of the curing process, road markings will be applied to delineate traffic flow, designated turning areas, and pedestrian exclusion zones.

3.5.10 Bunded Tank Farm

The tank farm is constructed within a fully contained lowered bunded area to prevent the escape of liquids in the unlikely event of a major tank failure or spillage. The concrete bund will be designed and constructed in accordance with the requirements of

- IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities (EPA, 2004)
- BS 8007 Code of practice for design of concrete structures for retaining aqueous liquids (BSI, 1987)
- CIRIA C736 Containment systems for the prevention of pollution (CIRIA, 2014)

The bunded area will be capable of retaining 110% of the largest tank volume or 25% of the total installed tank volumes (whichever is the greatest) with an appropriate freeboard depth. Refer to Section 3.3.7.11. The bund will provide impermeable secondary containment and will be subject to integrity testing prior to commissioning.



The tank farm and bunded area will consist of a series of insitu concrete raft style tank foundations (refer to Figure 3-29) within a larger concrete area.

Refer to Section 3.5.8.2. The proposed bund farm area will be locally excavated to formation level. The proposed tank foundation and bund floor formation will typically comprise a layer of lean mix concrete blinding, atop CI804 compacted aggregate, atop CI 6F1 aggregate. Aggregates will be placed in layers and compaction will be achieved using a vibratory roller compactor.

The formation will be locally deepened in areas to accommodate the tank foundations. Tank foundations will be typically 300mm to 500mm in depth dependant on the overall tank loading and up to 36m in diameter.

Similar to other concrete works, post completion of the placement of reinforcement steel (manually tied in place), formworks will be constructed/installed atop the individual tank foundations. Concrete pumping will be used to place the concrete within the forms which will be compacted using a vibratory poker. The surface will be allowed to cure prior to power floating to achieve the required finish.



Figure 3-29: Construction of Digester Tank Foundations (BioWatt, 2026)

Post completion of all tank foundations the reinforced concrete bund floor will be poured and placed around the tank foundation to form a singular monolithic impermeable base for the bund area. A reinforced concrete wall will then be constructed about the entire bund perimeter. The bund wall will include integrated reinforced concrete access ramp for vehicular and crane access to the bund area. The reinforced concrete bund wall will be constructed sectionally, reinforcement bars will be tied in place manually by steel fixers. Post completion of the reinforcement steel, metal formworks will be lifted into place by crane and suitably supported/propped. Imported Ready-mix concrete will be pumped into the construction formwork; vibratory pokers will be used to ensure the concrete is fully compacted and left to cure/harden. After a few days, the formwork will be stripped from the concrete walls to be reused in the proceeding sections.

Storm water and drainage from the bund area are discussed Section 3.3.17 and Section 3.4.11.

3.5.10.1 Primary and Secondary Digesters

Primary and Secondary digesters will be constructed in steel. The steel digesters are constructed using coated steel plates for the liquid zone and stainless steel (AISI316) for the top gas zone (top ring and roof). The steel plates will be delivered to site in segments.



The digester roof will be constructed first. Individual stainless steel roof sections will be bolted together along spines radiating between two concentric circles forming the conical tank roof (See Figure 3-30). Once the conical roof is constructed at ground level a series of hydraulic jacks will be connected to the structure. The hydraulic jacks will raise the roof so that a single tank ring section can be constructed beneath. Once the top ring is complete, the jacks will lower the roof, and the roof and top ring section will be bolted together. The lifting process is repeated with ring after ring of tank being added until it reaches its final height.



Figure 3-30: Stainless Steel Roof - Ground Level Construction (Balmoral Tanks, 2026)

Insulation will be mounted on the outside tank wall and finished with trapezoid cladding as the tank is raised. A top mounted agitator will be installed on the tank's roof by crane.



Figure 3-31: Digester Tank Construction (Biogas Consulting , 2026)

3.5.10.2 Tertiary Digesters and Liquid Pre Storage Tank

The construction of concrete tanks will require manual fixing of reinforcement steel followed by the installation of appropriate steel formworks using a crane. The steel forms will be bolted together and appropriately propped (See Figure 3-32). A concrete pump will be fed via a ready-mix concrete wagon to deliver concrete to the forms.

The concrete will be suitably compacted by use of a vibratory poker. Post curing of the concrete, the steel formwork will be removed and cleaned for reuse in the next lift i.e. the used formwork will be reinstalled atop the newly formed wall to allow placement of the next concrete lift.



Figure 3-32: Climbing Concrete Formwork (RSB formwork technology, 2026)

Post completion of the concrete works the tank will be external clad with an insulated metal cladding. The cladding will be affixed to the entire external perimeter of the tank. Mechanical plant will be installed within the tanks. The double layer gas membrane roof will be installed to seal the entirety of the tank roof forming a gas tight flexible dome.

3.5.10.3 Post Digestion Liquid Digestate Storage Tank and Digestate Storage Tank

The Post Digestion Liquid Digestate Storage Tank will be constructed in an identical fashion to the Tertiary Digestion Tanks excluding the addition of external insulated cladding.

3.5.11 Desulphurisation Plant, Gas Upgrade Plant, CO₂ Liquefaction Plant

The proposed desulphurisation plant components, gas upgrade plant components, and CO₂ Liquefaction plant components will be prefabricated off site, delivered by truck to site and craned into place. Electrical and mechanical connections will be made on site aided by mobile cranes and Mobile Elevated Work Platform (MEWP). Post completion of all connections and instrumentation and period of commissioning will be completed including testing, cold commissioning and hot commissioning.



Figure 3-33: Biogas Desulphurisation Plant Source (CSO Group, 2026)



Figure 3-34: Amine Biogas Upgrader – Ammongas (World Biogas Association, 2026)



Figure 3-35: CO₂ Liquefaction Plant (Tonder Biogas)

3.5.12 Biomethane Network Entry Facility

The proposed Biomethane Network Entry Facility (BNEF) will be prefabricated off site, delivered by truck to site and craned into place. Electrical and mechanical connections will be made on site aided by mobile cranes and MEWP. The BNEF contains telemetry and analysers to measure the parameters listed in Table 3-9. Odour is added to the biomethane at this point. Pipework will be installed within trenches excavated on site backfill to GNI specifications with respect to minimum cover. The BNEF infeed pipe will run between the Gas Upgrade Plant and the BNEF. The BNEF return pipe (rejecting non specification biomethane) will run between the BNEF and the Tertiary digesters (See Section 3.3.7.3). Approximately 3-4 hours of gas storage will be available within tertiary digester domes. In the event of gas dome storage being exhausted, reject gas will be flared (See Section 3.3.15)

Internal gas pipe trenches will be excavated and backfilled using an excavator. Pipes will be welded together onsite and suitably pressure tested.

Post completion of all connections and instrumentation and period of commissioning will be completed including testing, cold commissioning and hot commissioning.



Figure 3-36: Biomethane Network Entry Facility (Prefabricated Unit - Illustration) (Gas Networks Ireland)



3.5.13 Administration Building and Weighbridge Office

These will be of a standard concrete construction with the inclusion of rooms to include offices, storerooms, laboratory, conference room etc as detailed in Section 3.3.16.

3.5.14 Weighbridge

The weighbridge will be prefabricated off site, delivered by truck to site and craned into place on a poured reinforced concrete foundation. Electrical and mechanical connections will be made on site aided by mobile cranes and MEWP. Post completion of all connections and instrumentation and period of commissioning will be completed

3.5.15 Mechanical and Electrical

A mechanical and electrical (M&E) contractor will be appointed by Greengate Biogas 001 Ltd. to install and commission all M&E plant.

3.5.16 Ancillary Infrastructure

All ancillary infrastructure will be installed and commissioned in strict accordance with the original equipment manufacturer specifications and the designated supplier's technical requirements.

3.5.17 Landscaping

Landscaping will be carried out in accordance with the Landscape Plan included in Volume 4 of this EIAR.

3.6 Construction Methodology: Renewable Natural Gas - Network Connection

GNI will be responsible for extending the gas pipeline to the proposed development site and a road opening licence will be required to be obtained by GNI from Carlow County Council (CCC) to undertake these works. GNI is responsible for detailed design and for obtaining all consents from regulatory bodies not limited to utility providers, OPW, Carlow County Council and TII in advance of the submission of an application for development consent. At construction stage, all consents will be in place and GNI will have detailed drawings showing all services in the area. All Uisce Éireann assets along the proposed pipeline route must be identified. Uisce Éireann does not permit build over of its assets. Separation distances from public infrastructure, as per Uisce Éireann's Standards, Codes and Practices must be achieved. GNI must obtain a Confirmation of Feasibility from Uisce Éireann Diversions team prior to the lodgement of a planning application if it seeks to build under/over or divert Uisce Éireann's assets.

It is planned that the gas pipe will be laid in the grass verge alongside the existing road (where possible) or under the existing road itself. The final route will be determined by GNI at detailed design stage.

The pipe will be laid at approximately 100 metres per day by open cut method. Residents affected will be notified by GNI via a letter drop approximately 1 week before the works are due to start with disruption kept to a minimum and access to properties will be maintained.

A site-specific traffic management plan will be prepared by a specialist traffic management team. This will be required by Carlow County Council to obtain the road opening licence. Reinstatement will be as specified by Carlow County Council as a condition of the road opening licence.



The proposed gas pipeline connection will require both standard cut and cover construction (i.e. excavate trench, place pipe, cover pipe and reinstate surface finish) and horizontal directional drilling methods of installation.

3.6.1 Trenchless Construction - Horizontal Directional Drilling (HDD)

HDD is a construction method that can be used to advance a pipeline where open cut trenching construction is not preferable.

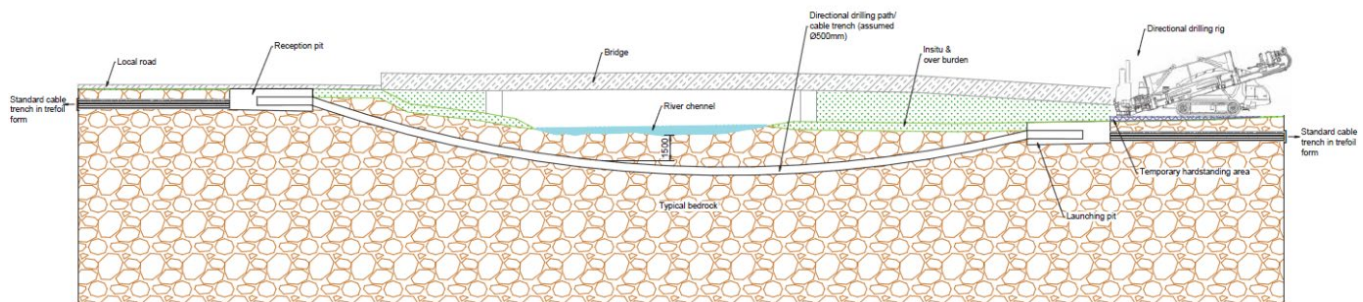


Figure 3-37: HDD Activity Profile

In HDD, a drill head is driven through the ground in the desired alignment and depth, which can be measured precisely. Drilling is done from a launch pit (2 m x 5m) at one end of the reception put at the other end of the area (2 m x 5m).

A pilot hole will be bored as per the agreed alignment and will be tracked and controlled using a transmitter in the drill head. By tracking the depth, position and pitch of the drill head the operator can accurately steer the line of the drilling operation. The drilling operation is lubricated using a fluid. When the pilot hole has been drilled to the correct profile, its diameter is increased if necessary to match the external diameter of the protective pipe duct.

To avoid damage to the gas pipe that must pass through the borehole, the gas pipe is placed in a protective pipe (PE). The protective pipe, with the gas pipe (250 mm diameter), is then pulled through the bore. The works areas around the launch and reception pits is 40 m². This allows for the drill rig and winch, drilling rods, room to weld pipe before pulled into bore and space for traffic management around works area.

The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod, and the operator will commence to drill into the launch pit to a suitable angle which will enable the excavation to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore will continue with the addition of 3.0 m long drill rods, mechanically loaded and connected into position.

During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ (environmentally friendly product (not toxic to aquatic organisms)) and water is pumped through the centre of the drill rods to the reamer head and is forced into void and enables the annulus which has been created to support the surrounding sub soil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it may be necessary to repeat the drilling process by incrementally increasing the size of the reamers.

When the reamer enters the launch pit, it is removed from the drill rods which are then passed back up the bore to the reception pit and the next size reamer is attached to the drill rods and the process is repeated until the required bore with the allowable tolerance is achieved.



The use of a natural, inert and biodegradable drilling fluid such as Clear Bore™ is intended to negate any adverse effects arising from the use of other, traditional polymer-based drilling fluids and will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the reception or drilling pits, it will be contained and removed from the site in the same manner as other subsoil materials associated with the drilling process to an approved disposal site. Backfilling of launch and reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches and joint bays.

Once the drilling is complete, the gas pipeline lies in the ground surrounded by the protective pipe.

3.6.1.1 Motorway Crossing

As per Section 3.3.20, it is proposed to traverse beneath both carriageways of the M9 using a trenchless construction methodology such as HDD. It is the preferred option of TII for motorway crossings. All works are subject to TII approval.

The locations of the launch and reception pits will be adequately spaced from the carriageway and outside of the MMarC contract boundary as per Figure 3-18 to ensure the bore is at such depth as not to conflict with the drainage or surface of the motorway or associated embankments. The section of pipe under the motorway will be seamless, i.e. no joints.

3.6.1.2 River Barrow Crossing

As per Section 3.3.20, a trenchless construction methodology such as Horizontal directional drilling (HDD) will be used to traverse the River Barrow to avoid any works in the Cardinal Moran Bridge carrying the R448 across the River Barrow.

The locations of the launch and reception pits will be located to ensure the bore is at such depth as not to conflict with the riverbed, any drainage R448 or foundations of the bridge. GNI will be responsible for obtaining the necessary approvals from Carlow County Council such as a road opening licence.

It is proposed to use HDD to cross two existing land drains under the L3034.

3.6.1.3 Construction Phase HDD

The operation will take place from one side of the watercourse or motorway within the public road corridor and will be carried out by an experienced HDD specialist.

In the case of HDD operations within the public road corridor, the works will be carried out in accordance with measures described in the Traffic Management Plan contained within the CEMP in Appendix 3.1 of Volume 3 of this EIAR.

The process will involve setting up a small, tracked drilling rig on one side of the watercourse or motorway. In the case of the River Barrow crossing, launch and reception pits will be located in R448. In the case of the motorway, the pits will be located at a sufficient distance to drill under the motorway, which is in a cut and outside of the motorway reservation.



A shallow starter pit will be excavated at the point of entry and will be located at a sufficient distance from the watercourse or motorway to achieve a minimum clearance depth below the bed of the watercourse and motorway foundation and services. A pilot hole will be bored as per the agreed alignment and will be tracked and controlled using a transmitter in the drill head. By tracking the depth, position and pitch of the drill head the operator can accurately steer the line of the drilling operation. The drilling operation is lubricated using a fluid. When the pilot hole has been drilled to the correct profile, its diameter is increased by a reaming process to match the external diameter of the gas pipeline (250 mm). The flexible plastic ducting is then pulled through the pre-drilled hole and sealed at each end until required for the gas pipe.

Minimum environmental protection measures to be implemented on site will include the following:

- A site-specific drilling design, risk assessment and method statement will be prepared by the contractor prior to the works.
- Utility plans are available on site. The presence of all buried utilities will be confirmed and marked on the ground.
- Where overhead and underground services have been identified the ESB Code of Practice for Avoiding Danger from Over Head Electricity Lines and the HSA Code of Practice for Avoiding Danger from Underground Services are complied with.
- If drilling fluids are required, a biodegradable fluid such as Clear Bore™ will be used rather than Bentonite.
- HDD operations to be limited to daytime hours and conditions when low levels of rainfall are forecast.
- The depth of the bore will be at least 3m below the bed of the watercourse and as per TII instruction under motorway.
- A field response plan to minimize loss of returns of drilling fluid and actions to restore returns will be provided.
- Silt fences will be constructed around proposed work areas prior to commencement of works.
- No refuelling will take place within 50m of the watercourse or any sensitive habitats. Pre-construction verification surveys will take place at drilling sites to confirm the presence of any sensitive species.
- The Contractor will provide full time supervision of the HDD and installation of the pipe by appropriate qualified personnel, i.e. in HDD and gas pipe installation.

A detailed survey of buried services within the public road to confirm the conditions predicted in this EIAR will be carried out by the contractor prior to commencement of the operation. Site investigation will be required to inform detailed design.

Carlow County Council and TII will be made aware in advance of the operation and invited to oversee the activity.

3.6.1.4 Commissioning of the Gas Pipeline

GNI has full and sole responsibility for commissioning and operating the proposed gas pipeline.

3.7 Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) has been prepared for the proposed development and is included in Volume 3, Appendix 3.1.



The CEMP will be updated prior to construction to take account of any amendments arising during the consenting process and relevant conditions attached to the planning permission and will be implemented for the duration of the construction phase of the project. The EOP will be a live document and will be reviewed and updated as required.

3.8 Use of Materials

Natural resources will be consumed/used during the construction and operational phases of the proposed development.

3.8.1 Construction Phase Material Use Proposed Development

Table 3-11 outlines the principal quantities of natural resources/materials to be used in the construction of the facility. The table outlines the material usage for the principal site components. Assumptions, where used, are noted.

Table 3-11: Use of Natural Resources

Category	Element	Natural Resources	Quantity	Units
Circulation Yard	Yard Area	Concrete	10,920,000	kg
		Steel Reinforcement	56,420	kg
		Subbase CI 804	3,639,090	kg
		Sub Grade CI 6F1	5824000	kg
Solid Waste Reception Building	Materials Bunker area	Concrete Floor	847,200	kg
		Uplift concrete for foundation	84,720	kg
		Reinforcement Steel	35,300	kg
		Uplift concrete for foundations	3,530	kg
		Subbase CI 804	188,220	kg
		Sub Grade CI 6F1	338,880	kg
	Bunker Retaining Walls	Area		
		Concrete	558,749	kg
		Uplift for Retaining Wall toe concrete	335,249	kg
		Reinforcement steel	34,922	kg
		Uplift for Retaining Wall toe steel	20,953	kg
	Solids Infeed Areas	Concrete floor	1,249,920	kg
		Reinforcement Steel	6,458	kg
		Subbase CI 804	347,113	kg
		Sub Grade CI 6F1	694,400	kg



Category	Element	Natural Resources	Quantity	Units
	Structure	Primary Structural Steel	170940	kg
		Secondary Structural Steel	17094	kg
		Roof Cladding	1758.24	panels
		Wall Cladding	3042.01875	panels
Liquid Reception Building	Main Area	Concrete Floor	547,063	kg
		Foundations	54,706	kg
		Steel Reinforcement	12,537	kg
		Subbase Cl 804	151,924	kg
		Sub Grade Cl 6F1	303,924	kg
		Raised curbed area	129,276	kg
	Rooms	Walls		
		Concrete blocks	1,002	blocks
		Hollow core Precast floor	37	panel
	Structure	Reinforcement Steel	27,353	kg
		Structural Steel	273,532	kg
		Secondary Steel	27,353	kg
		Roof Cladding	608	panels
		Cladding	999	panels
Solid Digestate Building	Stub wall	Concrete	23,530	kg
		Uplift for concrete	14,118	kg
		Reinforcement steel	1,471	kg
		Uplift for steel	882	kg
	Retaining wall	Concrete	367,248	kg
		Uplift for concrete	220,349	kg
		Reinforcement Steel	22,953	kg
		Uplift for steel	13,772	kg
		Concrete Floor	758,160	kg
		Foundations	75,816	kg
		Steel Reinforcement	17,375	kg
		Subbase Cl 804	210,547	kg
		Sub Grade Cl 6F1	421,200	kg
	Digestate storage Structure	Reinforcement Steel	51,244	kg
		Structural Steel	512,435	kg
		Secondary Steel	51,244	kg



Category	Element	Natural Resources	Quantity	Units
		Roof Cladding	616	panels
		Cladding	1529.5525	panels
	Electrical Building Structure	Reinforcement Steel	7,641	kg
		Structural Steel	76,410	kg
		Roof Cladding	226	panels
		Cladding	502.659	panels
		Concrete Floor	946,080	kg
		Foundations	94,608	kg
		Steel Reinforcement	4,888	kg
		Subbase CI 804	262,734	kg
		Sub Grade CI 6F1	525,600	kg
	Retaining wall	Concrete	661,440	kg
		Uplift for concrete	396,864	kg
		Reinforcement Steel	41,340	kg
		Uplift for steel	24,804	kg
	Full height Walls	Concrete blocks	4180.3125	blocks
	Half Height Walls	Concrete blocks	2446.09375	blocks
		Hollow core Precast Roof	106	panel
	Entire Building except Ash Container Structure	Reinforcement Steel	123,480	kg
		Structural Steel	1,234,800	kg
		Secondary Steel	123,480	kg
		Roof Cladding	960	panels
		Cladding	1981.77375	panels
	Ash Container Structure	Reinforcement Steel	3,976	kg
		Structural Steel	39,758	kg
		Roof Cladding	82	panels
		Cladding	649.267875	panels
Tank Farm Bund	Foundation Primary Digester	Concrete	5,690,012	kg
		Steel Reinforcement	355,626	kg
		Subbase CI 804	1,264,131	kg
		Sub Grade CI 6F1	2,276,005	kg
	Foundation Secondary Digester	Concrete	5,161,008	kg
		Steel Reinforcement	322,563	kg
		Subbase CI 804	1,146,604	kg



Category	Element	Natural Resources	Quantity	Units
	Foundation Tertiary Digester	Sub Grade CI 6F1	2,064,403	kg
		Concrete	1,154,535	kg
		Steel Reinforcement	72,158	kg
		Subbase CI 804	256,499	kg
		Sub Grade CI 6F1	461,814	kg
	Foundation Digestate Storage	Concrete	1,290,252	kg
		Steel Reinforcement	80,641	kg
		Subbase CI 804	286,651	kg
		Sub Grade CI 6F1	516100.8	kg
	Foundation Pasteurisation	Concrete	411,264	kg
		Steel Reinforcement	21,420	kg
		Subbase CI 804	114,211	kg
		Sub Grade CI 6F1	205632.0	kg
Tank Farm Base	Tank Foundation	Concrete	14311562	kg
		Steel Reinforcement	73943	kg
		Subbase CI 804	4769328	kg
		Sub Grade CI 6F1	7632833	kg
Gas upgrade Area	Foundation De-sulphurisation plant	Concrete	296,640	kg
		Steel Reinforcement	1,533	kg
		Subbase CI 804	82,379	kg
		Sub Grade CI 6F1	164,800	kg
	Foundation CO2 liquefaction plant	Concrete	950,400	kg
		Steel Reinforcement	4,910	kg
		Subbase CI 804	263,934	kg
		Sub Grade CI 6F1	528,000	kg
	Foundation Gas Upgrade	Concrete	252,000	kg
		Steel Reinforcement	1,302	kg
		Subbase CI 804	69,983	kg
		Sub Grade CI 6F1	140000	kg
Admin Building	Main Area	Concrete Floor	316,800	kg
		Steel Reinforcement	7,260	kg
		Subbase CI 804	87,978	kg
		Sub Grade CI 6F1	176,000	Kg
	Rooms	Concrete blocks	58750.3125	blocks



Category	Element	Natural Resources	Quantity	Units
	Structure	Hollow core Precast Roof	262	panel
		Reinforcement Steel	8,415	kg
		Structural Steel	84,150	kg
		Roof Cladding	352	panel
		Cladding	530.8	panel
ESB sub station	Main Area	Concrete Floor	43,200	kg
		Steel Reinforcement	990	kg
		Subbase CI 804	11,997	kg
		Sub Grade CI 6F1	24,000	kg
	Structure	Reinforcement Steel	1,148	kg
		Structural Steel	11,475	kg
		Cladding	149.2	panel
		Roof Cladding	48	panel
Car park	Surface Finish	HRA	302,400	kg
	Foundation	Subbase CI 804	83,979	kg
		Sub Grade CI 6F1	168000	kg

Please note some of the above materials/quantities have been mitigated during the climate assessment. Mitigation measures are documented in Chapter 9 of Volume 2 of this EIAR.

3.8.2 Construction Phase Material Use and Generation Gas Pipeline

Gas Network Ireland will supply all materials for the construction of the gas pipeline and will be responsible for the management of any waste generated. At 9.6 km long, the estimated materials used and generated are included in Table 3-12.

Table 3-12: Construction Materials Gas Pipeline

Category	Element	Quantity	Units
Construction	Gas Pipes	9.6	km
	Sand	6,998,400	kg
	Subbase CI 804	5,182,704	kg
	HRA	5,414,400	kg



3.8.3 Operational Phase Material Use

Natural resource consumption during the operational phase will include:

- Diesel fuel for site machinery
- Groundwater
- Woodchip
- Power

Diesel consumption per year, assuming the average loading shovel consumes on average 11.5 litres/hour¹¹ and operates for 275 days per year, 6 hours per day average will be 20,500 litres per year.

Water usage will be from an onsite groundwater well and from rainwater harvested from clean areas of the site. The estimate process water usage will be 62,000 m³/year (170 m³/day) sourced from rainwater harvesting onsite (65-130 m³/day) and the proposed groundwater well (100-120 m³/day avg.)

Potable water will be supplied by a drinking water delivery. The estimated potable water usage for 28 Full Time Employee equivalents at 140 litres/day, 275 days/year will be 770 m³/year.

The proposed biomass boiler will consume approximately 13,000 tonnes per annum of indigenously sourced woodchip (RED compliant).

The primary power demand on site will be from the operation of the process plant and ancillary usage e.g. lighting to site offices and perimeter lighting.

The total estimated power usage will be approximately 30,660 MWh per annum. This includes the total estimated power that will be provided by solar at 430 MWh per annum.

The construction and operation of the proposed facility will produce various waste streams requiring recovery or disposal. A resource and materials management plan is included in the CEMP in Appendix 3.1 of Volume 3 of this EIAR. This plan states how resources, materials and wastes will be managed throughout the construction and operational phase of the proposed development.

3.8.4 Operational Phase Proposed Development Material Generated

As per the CEMP and during the operation of the facility the IE Licence will require the implementation of an Environmental Management System (EMS) which will include detailed procedures for the management of all operational waste generation. The main wastes that will be generated, their sources, quantities and their proposed destination is outlined in Table 3-13.

¹¹ [Caterpillar Performance Handbook](#), Cat 950M Waste Handler



Table 3-13: Operational Waste Management Schedule

Operational Waste Type	Description and Source	Quantity (Tonnes/Yr.)	Destination
Physical Contaminants	Stones, Grit, Horse shoes and other physical contaminants removed from liquid and solid feedstock streams	<500	Non-Hazardous Landfill
Biomass Boiler Ash	Ash generated from the proposed biomass boiler	133	Non-Hazardous Landfill
Spent Activated Carbon	Spent activated carbon sourced from the proposed Odour Abatement System and the Desulphurisation plant	28	Specialist Hazardous Waste Treatment Specialist
Spent Amine Solution	Spent Amine solution sourced from the proposed biogas upgrading plant	6	Specialist Hazardous Waste Treatment Specialist
Canteen and Office Waste	Waste generated from staff on site in offices and canteen	5	Waste recycling/recovery facility
Septic Tank Waste	Waste from wastewater system	385	Wastewater treatment plant

This waste will be removed off site by waste collection contractors holding valid Waste Collection Permits to approved authorised facilities.

3.9 Decommissioning

The expected lifetime of the facility is 30 years. Upon cessation of anaerobic digestion activities at the site, the facility will be decommissioned in accordance with a Closure Plan for the facility, which will be prepared as a condition of the IE licence for the proposed development.

The following closure and decommissioning tasks will be completed under this Closure Plan:

- i) All feedstock supply will cease. Digestion will continue for the full retention period (60 days) All treated digestate will pasteurised and transferred back to farm.
- i) All wastewaters collected on-site will be collected and removed for treatment at authorized wastewater treatment plant
- i) All hard-standing areas and drainage systems including interceptors and underground tanks/chambers will be cleaned and washed down.
- i) Plant, equipment and tanks will be safely decontaminated/cleaned using standard procedures and competent contractors/staff e.g. desulphurisation plant, CO₂ liquefaction plant, gas upgrade plant, flares, BNEF.
- i) All plant and equipment present on-site will be decommissioned and either resold, reutilized at a separate site operated by the applicant, or scrapped.
- i) Office and staff facilities will be cleaned and emptied of all documents and IT equipment previously associated with the operation of the proposed development.



- i) The buildings, concrete hardstanding, weighbridge, drainage systems, boundary/treatment/landscaping and fencing may be left in-situ if value for sale or dismantled for recovery, recycling and reuse as appropriate.
- i) Environmental monitoring, inspection and management will be undertaken during closure to confirm that closure and decommissioning tasks do not generate emissions to environmental harmful to receiving environmental media (e.g., ambient air, soil, groundwater, storm water).
- i) Records relating to material management, and environmental management, monitoring and assessment will be retained by the applicant.

The closure plan will be submitted to the EPA for approval, following by a closure audit. Only upon completion of all licensed steps, will the EPA grant a licence surrender.



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