3 Consideration of Alternatives

3.1 Introduction

The purpose of this chapter is to present the reasonable alternatives considered by the developer during the design and pre-application phases of the Proposed Development.

3.2 Legislative Context

Annex IV (2) of the EIA Directive 2014/52/EU requires the consideration of reasonable alternatives which are relevant to the project and take into account the effects of the project on the environment. An EIAR must contain:

"…*a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment*."

Schedule 6 of the Planning and Development Regulations, 2001 (as amended) sets out the information which is to be contained in an EIAR and Part 1 (d) of Schedule 6 states that the following shall be included:

"*A description of the reasonable alternatives studied by the person or persons who prepared the EIAR, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed development on the environment*."

In accordance with 2022 EPA Guidelines, different types of alternatives may be considered at several key stages during the process. As environmental issues emerge during the preparation of the EIAR, alternative designs may need to be considered early on in the process or alternative mitigation options may need to be considered towards the end of the process.

The EPA Guidelines (EPA, 2022) state:

"*The objective is for the developer to present a representative range of the practicable alternatives considered. The alternatives should be described with 'an indication of the main reasons for selecting the chosen option'. It is generally sufficient to provide a broad description of each main alternative, and the key issues associated with each, showing how environmental considerations were taken into account is deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required*."

The consideration and examination of alternatives is set out in the following sections.

3.3 Methodology

The EU Guidance Document (EU, 2017) on the preparation of EIAR outlines the requirements of the EIA Directive and states that, in order to address the assessment of reasonable alternatives, "*the Developer needs to provide:*

- *A description of the reasonable alternatives studied, and;*
- *An indication of the main reasons for selecting the chosen option with regards to their environmental impacts.*

The EU 'Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)' (EU, 2017) states that reasonable

alternatives "*must be relevant to the proposed project and its specific characteristics, and resources should only be spent assessing these alternatives*". The guidance also acknowledges that "*the selection of alternatives is limited in terms of feasibility. On the one hand, an alternative should not be ruled out simply because it would cause inconvenience or cost to the Developer. At the same time, if an alternative is very expensive or technically or legally difficult, it would be unreasonable to consider it to be a feasible alternative*".

The current EPA 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' (EPA, 2022) state that "*It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'miniEIA') of each alternative is not required*."

With consideration of the legislative and guidance requirements taken into account, this chapter addresses alternatives under the following headings:

- Do Nothing Scenario;
- Alternative Locations;
- Alternative Designs and Layouts; and
- Alternative Technical Configurations.

3.4 Consideration of Alternatives

3.4.1 Do Nothing Scenario

Article IV, Part 3 of the EIA Directive states that the description of reasonable alternatives studied by the developer should include "*an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge*." This is referred to as the 'Do Nothing' scenario.

EU guidance (EU, 2017) states that the assessment should involve the assessment of "*an outline of what is likely to happen to the environment should the Project not be implemented – the so-called 'do nothing' scenario*."

In implementing this 'Do-Nothing' scenario, an Anaerobic Digestion Facility would not be developed and there would be no changes made to existing land-use practices. The site would likely continue to be used for agricultural grazing.

The Climate Action and Low Carbon Development (Amendment) Act 2021 has committed Ireland on a legally binding path to net-zero emissions by no later than 2050, and to a 51% reduction in emissions by 2030. Indigenously produced biomethane will play a significant role in enabling this transition to a net-zero economy as biomethane can to displace fossil gas in many hard-to-decarbonise sectors, such as high-temperature heat, while also playing a significant role in the decarbonisation of County Kildare's agriculture sector. In the 'Do-Nothing' scenario, the opportunity to capture a volume of County Kildare's bioenergy resource for the production of biomethane to supply the national grid would be missed.

Utilising the 2018 baseline year, according to the Kildare Climate Action Plan 2024 -2029, agriculture accounts for 13.8% of County Kildare's total carbon emissions, equating to 232,230 tCO2e per year. Methane emissions from livestock accounted for 87% of this emissions total. As outlined in the World Biogas Association report, "Global potential of biogas",

ORS

"By collecting and anaerobically digesting manure from livestock, there is a potential to offset 930 to 1260 Mt CO2 eq. per year of greenhouse gas emissions or 13 to 18% of the current livestock-related emissions. This offset comes in the form of avoided emissions from manure management and energy produced from the captured biogas generated from manure in a digester and using it to generate energy that can be used on the farm or exported."

The majority of agricultural manures and slurries will be sourced from agricultural operators within a 15km radius of the Proposed Development. In the 'Do-Nothing Scenario' these agricultural wastes would not be treated locally through the AD process. Untreated and unpasteurised manures and slurries would continue to be applied directly to the land at current volumes, with the continued addition of chemical fertiliser. Furthermore, the associated CH_4 would not be captured within the AD process. In addition, the current traffic movements associated with the movement of manures and slurries from source to lands for spreading would remain unchanged.

The Proposed Development will provide important construction stage employment. The construction phase will also have secondary and indirect 'spin-off' impacts on ancillary support services in the area of the site, such as retail services, together with wider benefits in the building supply services, professional and technical professions etc. These beneficial impacts on economic activity will be largely temporary but will contribute to the overall future viability of the construction sector and related services and professions over the construction period.

The operational stage will offer direct employment in the Anaerobic Digestion Facility, while also supporting existing employment opportunities on surrounding farms. Further indirect employment will be created as a result of the induced benefits of the development such as surrounding businesses catering for employee subsistence and hauliers, transporting materials to the facility. The Proposed Development will be of considerable benefit to the area in terms of employment provision and economic gain leading to a positive, medium-term impact which is significant in the context of its rural location.

The Proposed Development can deliver between 30-45 jobs to the immediate area (consisting of ca. 5-8 full time jobs in the biogas facility, 14 jobs in the applicant operational team and ca. 25 local contractors. Under the 'Do-Nothing' scenario the opportunity to generate direct and indirect local employment would be forgone. It would lead to a missed opportunity for an increase in employment opportunities in the area generally, and a missed opportunity for rural employment objectives of the County Development Plan to be fulfilled. The overall economic and social benefits that the development would bring to the area would not be experienced by the community in the event of the Proposed Development not occurring.

Under the 'Do-Nothing' scenario the opportunity to generate direct and indirect local employment would be forgone. It would lead to a missed opportunity for an increase in employment opportunities in the area generally, and a missed opportunity for rural employment objectives of the County Development Plan to be fulfilled. The overall economic and social benefits that the development would bring to the area would not be experienced by the community in the event of the Proposed Development not occurring.

The 'Do-Nothing' scenario is discussed in further detail within each EIAR technical assessment chapter.

3.4.2 Consideration of Alternative Locations

CycleØ Group, is a leading end-to-end biomethane plant developer that builds, owns and operates plants across Europe, with a dedicated manager, based in Ireland for the Irish

applications. Due to its portfolio of hundreds of successful biogas/biomethane installations in more than 40 countries globally, the group is well placed to equity-finance, build and operate this type of development. The development aims to support the Irish Governments' ambition to produce 5.7 TWh of indigenously produced biomethane by 2030, and also to provide farmers with a solution to the long-term management of slurry, manure and agri-waste through processing of the digestate fertiliser output. CycleØ have endeavoured to identify and investigate sites that would be suitable for the agri-centric biogas model that is proposed in the National Biomethane Strategy.

The key considerations for site selection were,

Grid Connection

A viable biomethane generation scheme must ideally be located near to existing gas grid infrastructure to minimise the transport/construction requirements e.g. preferable over the virtual pipeline model. Furthermore, connection to the electricity grid infrastructure is desirable so that excess electricity can also be exported to the national grid. Thus, a large weighting is applied for this criterium.

Proximity to feedstock providers/digestate receivers

An agri-centric model is being proposed, meaning that all feedstocks are derived from the agricultural sector and include manures, slurries, grass/maize silage and chicken litter. It is preferable to site the plant as proximate to the feedstock providers as possible such that transport of feedstocks/digestate is minimised. Thus, consideration was given to areas that had larger densities of farms that could provide these types of feedstock e.g. dairy herds, intensive pig/poultry farms i.e. aiming to have 80% of the feedstock within 15km or less of the site.

Existing land use

The preference is to locate the development on an existing rural brownfield site where possible e.g. disused intensive farm, surrendered licensed site such as quarry. It has been found that in general, there is limited availability of these kinds of sites, and those that are available tend to be less proximate to feedstock providers and closer to sensitive receptors e.g. on the outskirts of urban areas. Thus, greenfield sites with low biodiversity value were scoped as a reasonable alternative i.e. termed "improved agricultural pastureland", where trees have been removed, and land has been subject to fertiliser.

Proximity to sensitive human receptors

The preference is to locate the development as far from sensitive human receptors as possible, whilst also balancing the need to have sufficient road network accessibility. It should be noted that design measures, as described in the other EIAR chapters, aim to mitigate for any offsite impacts relating to noise, odour, fugitive gas emissions and air quality, irrespective of proximity of receptors.

Land availability

Preference was given to sites that could be purchased or leased on a long-term basis, but that were affordable, bearing in mind that land rents have increased more strongly in areas where dairy farming is more common (Teagasc "Annual Agricultural Land Market Review & Outlook 2024"). Thus, preference was given to sites where landowners were willing to facilitate a long-term lease or sale, subject to successful planning application.

Available land size

The sites with greater than 4ha are preferable as they facilitate optimum site layout e.g. allowing for ample turning space for vehicles, potential for more extensive landscaping that encourages biodiversity and provides site screening that is conducive to the local area.

Landscape sensitivity

The preference is to site the development in areas with medium to low landscape sensitivity i.e. Areas with the capacity to accommodate a range of uses without significant adverse effects on the appearance or character of the landscape having regards to localized sensitivity factors. Thus, greater weighting was allocated to sites that were further from sensitive landscapes e.g. further from designated scenic routes and viewpoints

Topography

Preferred topography is that of relatively flat and level, as opposed to undulating. In this way, less soil excavation and overall landscaping is required, minimising disturbance to the land. Furthermore, lowlands would have less impact on the visual amenities of the area.

Flood risk

Only sites zoned as Flood Zone C were considered as Flood Zones A & B would not be appropriate for a development of this type i.e. classified as a highly vulnerable development. Much of rural Ireland is zoned as Flood Zone C and so National Indicative Fluvial Mapping was also consulted as an indicator of areas that have potential to flood in future scenarios e.g. increased rainfall due to the effects of climate change

Ecological designations

Sites with further proximity from and no hydrological connectivity to designated ecological sites i.e. SACs, SPAs and NHAs, were prioritised. It should be noted that civil design measures recycle all grey water/recovered water back into the process, with only surface water from clean areas being allowed to discharge off site and controlled to greenfield run-off rates. Furthermore, it is intended that the development is considerate of the surroundings and so ability to landscape and screen the development is an important factor when considering sites relatively proximate to designated sites, or indeed nature areas that may not have specific designation e.g. nearby woodlands

Archaeological designations

Sites with known archaeological designations were discounted. In all cases, irrespective of presence of known archaeology, an archaeological assessment would be carried out, as well as excavation according to the National Monuments Service licensing procedures if evidence of archaeological artefacts were to be found.

Proximity to drinking water course/aquifer

Site selection endeavoured to avoid groundwater with high to extreme vulnerability status, regionally important aquifers and areas with hydrological connectivity to public water schemes, local private wells or drainage schemes. As stated earlier, all greywater/process water will be collected, and design measures are such that the development will not modify existing groundwater flow mechanisms i.e. surface water discharged at greenfield run-off rates, water is not extracted from adjacent watercourses as part of operational design.

Scoring Methodology

The above key considerations were given scores from 1 to 3 for different scenarios relating to that criteria e.g. a site that is adjacent to the gas distribution pipeline was given a score of 3, whereas a site that is further from the pipeline and that would require connection works of greater than 5km was given a score of 1. Similarly, a site that has favourable road conditions e.g. good site access opportunities, good sightlines, capacity for additional vehicles was given a score of 3, whilst sites that had no road access or whose road network comprised predominantly local (as opposed to regional) roads were given a score of 1.

A weighting of between 1 to 3 was applied to each criteria, where higher values were assigned to criteria that were more critical to the viability of the development e.g. proximity to the feedstock providers is essential for successful implementation of the agri-model. In some cases, the implemented design measures have reduced the weighting applied to specific criteria. For example, the civils design has the development operating independently of sewage and drainage schemes and not interacting with watercourses and groundwater as part of operational conditions.

Combining the two scoring mechanisms, a 3 x 3 matrix was devised, that presented the conclusion from the assessment of the site.

Table 3.1: Weighting applied to criteria

		Weighting applied to criteria		
		1	2	3
Criteria*	1	Possible, but requiring significant design measures, potentially not practical	Possible, but requiring significant design measures	Possible, but requiring further design measures and/or justification
	2	Suitable – minimal impact and minor further design measures required	Suitable – minimal impact and minor further design measures required	Suitable – minimal impact and minor further design measures required
	3	Suitable – minimal impact and minor design measures required	Suitable – minimal impact and minor further design measures required	Ideal – minimal impact option, optimum design measures
* specific criteria is detailed in **Table 3.2**2 below				

The site-specific selection criteria and basis for the assessment is included in **Table 3.2**.

Table 3.2: Site-Specific Selection Criteria and Basis for Assessment

Criteria	Scoring	Score	Weighting	Total Score
Access to Gas Grid	1. Greater than 5km, 2. 1-5km, 3. <1km or adjacent to site		3	
Access to Electricity Grid	1. Greater than 5km, 2. 1-5km, 3. <1km		1	
Proximity to Feedstock Supply/Digestate receivers	1. 80% available >15km 2. 80% available within 15km 3. 80% Available within 5 km or adjacent to major source of feedstock.		3	
Transport Network and Access	1. On local road with predominantly local roads network 2. On local road but with regional road network within 1-3km of the site 3. On regional road or less than 1km from Regional Road network. 4. Immediately adjacent to major source of feedstock allowing for transport internally.		3	
Existing land use	1. Urban or greenfield 2. Rural Brownfield, 3. Zoned Industrial		2	
Proximity to sensitive human receptors	1. Less than 250m. 2. less than 1km. 3. Greater than 1 km		3	
Land Availability	1. Not for Sale or Lease 2. Available for Sale or Lease but financially unviable 3. Owned or for sale/lease at achievable price		3	
Available Land Size	1. 1- 2ha 2. 2-3ha 3. Greater than 4ha		3	
Landscape Sensitivity	1. Proximate to Sensitive Landscape 2. Greater than 1km 3. Greater than 5km		2	

Landscape and Visual Amenity	1. Site is elevated or exposed 2. Site has existing cover and partial views 3. Site is hidden and with little or no receptors overlooking the site.		2	
Topography	1. Undulating or severe level changes 2. Moderate level changes that can be engineered out. 3. Relatively flat and level.		2	
Flood Risk	1. In a Flood Risk Zone 3. Outside Flood Risk Zone		3	
Ecological Designations Score	1. Adjacent to designated site 2. >1km from designated sites 3. >5km from designated sites		2	
Archaeological Designations Score	1.Adjacent to archaeology sites 2. >1km from archaeology sites 3. >5km from archaeology sites		1	
Proximity to Suitable Water Course or sewer (for surface water discharge)	1. Greater than 1km 2. Less than 1km. 3. Immediately adjacent or on site		3	
Proximity to Drinking Water Source/Aquifer	1. Less than 250m. 2. Less than 1km. 3. Greater than 1km		1	
Total Ranked Score				

4 no. alternative site locations within County Kildare and County Kilkenny were assessed under the above criteria, with the site at Ballyvass scoring highest overall. The regions chosen focussed on remaining proximate to the gas pipeline which traverses southwest from Dublin through Kildare, Kilkenny, Tipperary and terminating in Cork. The Site-Specific Selection Criteria and Basis for Assessments for each candidate site are included in **Appendix 3.1**.

The reasoning for identification of the Proposed Development site at Ballyvass as the preferred site is further discussed in the following sections.

3.4.2.1 Transport Network and Access

The Proposed Development site is located in the townland of Ballyvass, approximately 3.3km northwest of Castledermot, Co. Kildare, 10km southeast of Athy, Co. Kildare and 12km northeast of Carlow town. The site is accessed via the L8050, with the R448 within 2km and the R418 within 3km of the proposed site entrance, thus offering connectivity to various locations across the country. A HGV vehicle compatible site entrance is already present due to the quarry adjacent to the proposed site. In contrast, some of the other sites had no access to the site i.e. an enclosed field, or not proximate to regional roads.

3.4.2.2 Proximity to Feedstock Supply and Biobased Fertiliser Receivers

The Proposed Development has been designed to accept and treat up to 90,000 tonnes per annum of predominantly locally sourced agricultural manures, slurries, food processing residues and crop-based feedstocks. The geographical distribution of these feedstock suppliers and biobased fertiliser receivers is represented in **Figure 3.1**. 80% (37) of these sources are located within a 15km radius of the site and 100% (47) within a 25km radius of the site.

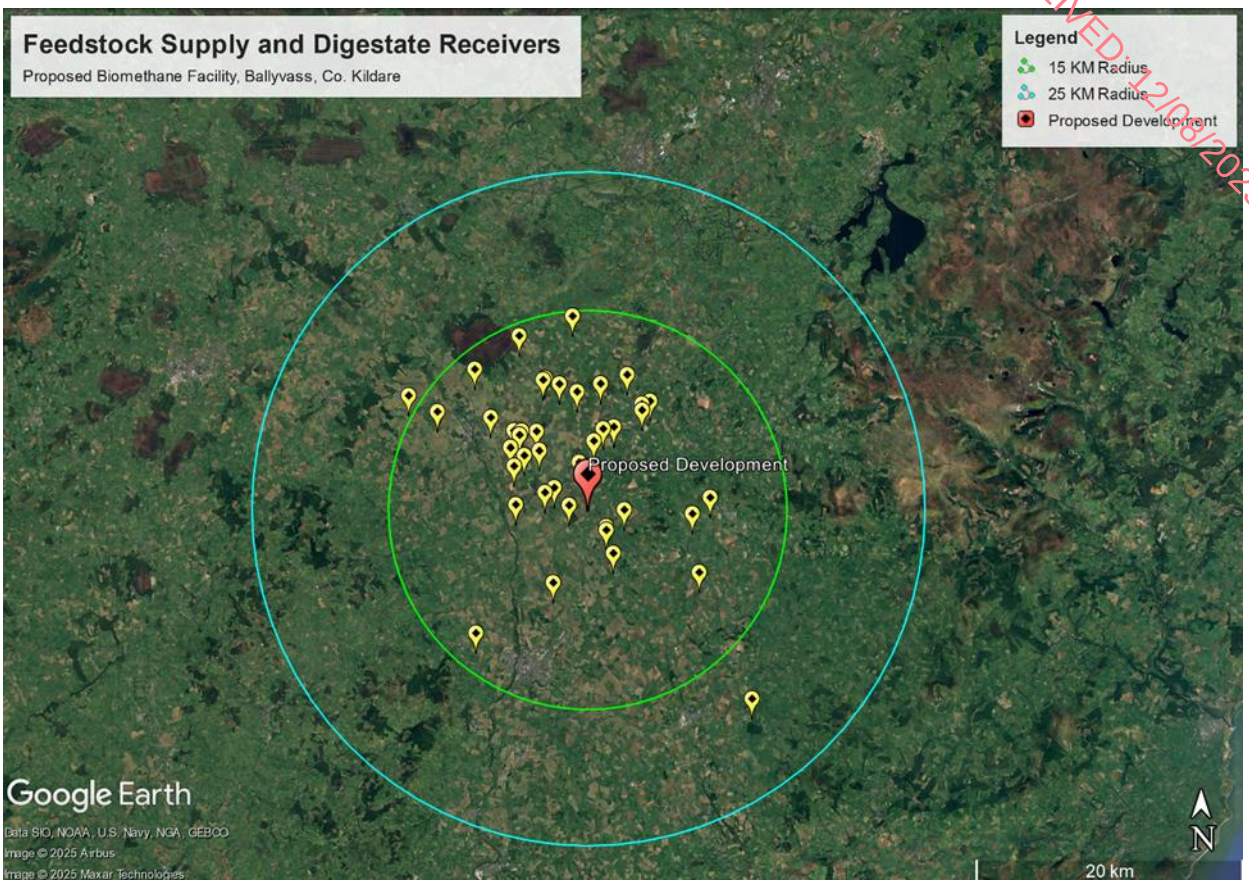

Figure 3.1: Feedstock Suppliers and Digestate Receivers

Alternative sites considered were deemed unsuitable for two primary reasons. Firstly, there was uncertainty regarding sufficient availability of agricultural feedstocks, in part due to commitment from feedstock providers to existing biogas plant. Secondly, the distances required to transport these feedstocks from their source locations to the alternative sites would result in significantly more HGV (heavy goods vehicle) movements compared to the current proposal. The increased HGV traffic would lead to higher estimated greenhouse gas emissions, which would conflict with the overall sustainability goals of the Proposed Development.

3.4.2.3 Proximity to the Existing Gas Network

Proximity to the existing gas network was a key consideration when considering alternative locations. In comparison to other locations considered, the site at Ballyvass benefits from existing infrastructure as the existing medium pressure distribution pipeline is located adjacent to the Proposed Development site. The existing medium pressure distribution gas pipeline location is shown in **Figure 3.2.**

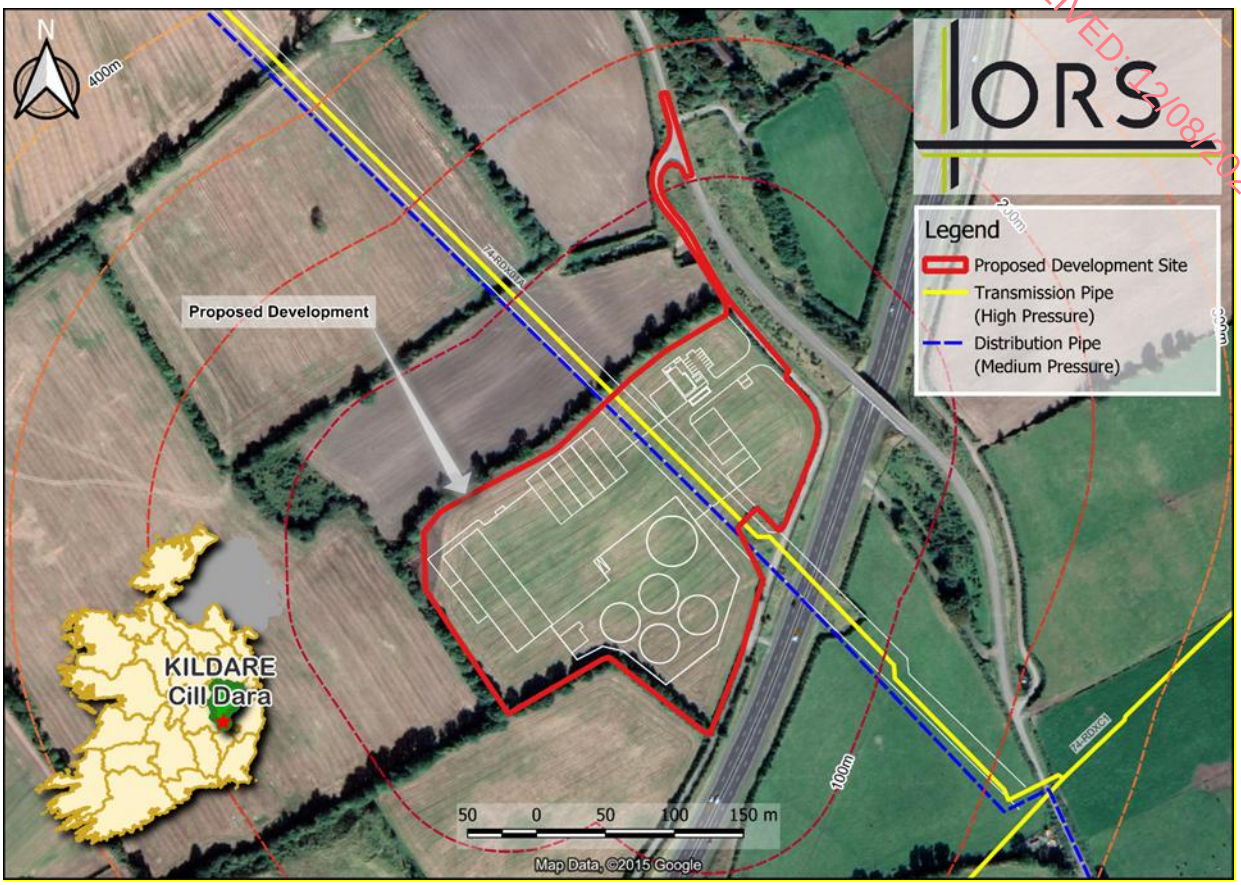

Figure 3.2: Local Existing Gas Network (Source: Gas Networks Ireland)

The other site locations considered were either not for sale or located significant distances from the existing national gas network (10km), meaning a direct connection point via a Grid Injection Unit (GIU) would not be feasible and/or economically viable.

3.4.2.4 Proximity to Sensitive Environmental Receptors and Designated Sites

An ecological assessment of the Proposed Development site found potential for hydrological connectivity between the site and River Barrow and river Nore SAC, which is located approximately 6km from the proposed site. This potential for connectivity arises via the Ballynamony Stream, 600m NE of the site, which flows into the River Barrow and river Nore SAC. Thus, a Natura Impact Assessment was carried out to outline mitigation measures both in construction and operation phase to prevent the possibility of contamination from the site into this SAC.

All work within the Proposed Development site will take place in areas considered to be of low biodiversity value on a local level (see Chapter 5 for more details).

3.4.2.5 Landscape and Visual Impact

Though not a designated site, the proximity of the Mulaghreelan Wood and the recreational and amenity use of Mullaghreelan was carefully considered as part of the landscaping plans (see chapter 11 for specific details of the assessment). A series of viewpoints were considered from all directions and an assessment with respect to viewpoint sensitivity and the likely magnitude

of change was made. This site was preferred to other sites due to its lowland location, and proximity to other developments such as the adjacent quarry and M9 motorway, which are well integrated into the overall landscape and indicative of the nature of the landscape character where development in the landscape is accompanied with good siting and integration. This contrasted with other site locations, which were on higher ground and thus more prominent in the landscape views.

3.4.2.6 Flood Risk

A preliminary flood risk assessment was undertaken for all candidate sites considered. There have been no recorded historic flooding incidents within the Proposed Development site boundaries, and no part of the Proposed Development work is scheduled within an area which has been declared as Flood Zone A or B. In contrast, National Indicative Fluvial Mapping at one site indicated potential for flood in future scenarios, from the adjacent river course.

A Site-Specific Flood Risk Assessment accompanies the planning application (Document Ref: **231239-ORS-XX-XX-RP-EN-13d-011**)

3.4.3 Consideration of Alternative Design and Site Layout

The design of the Proposed Development has been an informed and collaborative process from the outset, involving design, engineering, planning, environmental, hydrological, geotechnical, archaeological, landscape and traffic specialists. The design process has also taken account of the comments of the relevant statutory and non-statutory consultees as detailed in **Chapter 1: Introduction**.

Throughout the preparation of the EIAR, the layout of the Proposed Development has been revised and refined to take account of the findings of all site investigations and baseline assessments, which have brought the design from its first concept layout (**Figure 3.3**) to the final site layout.

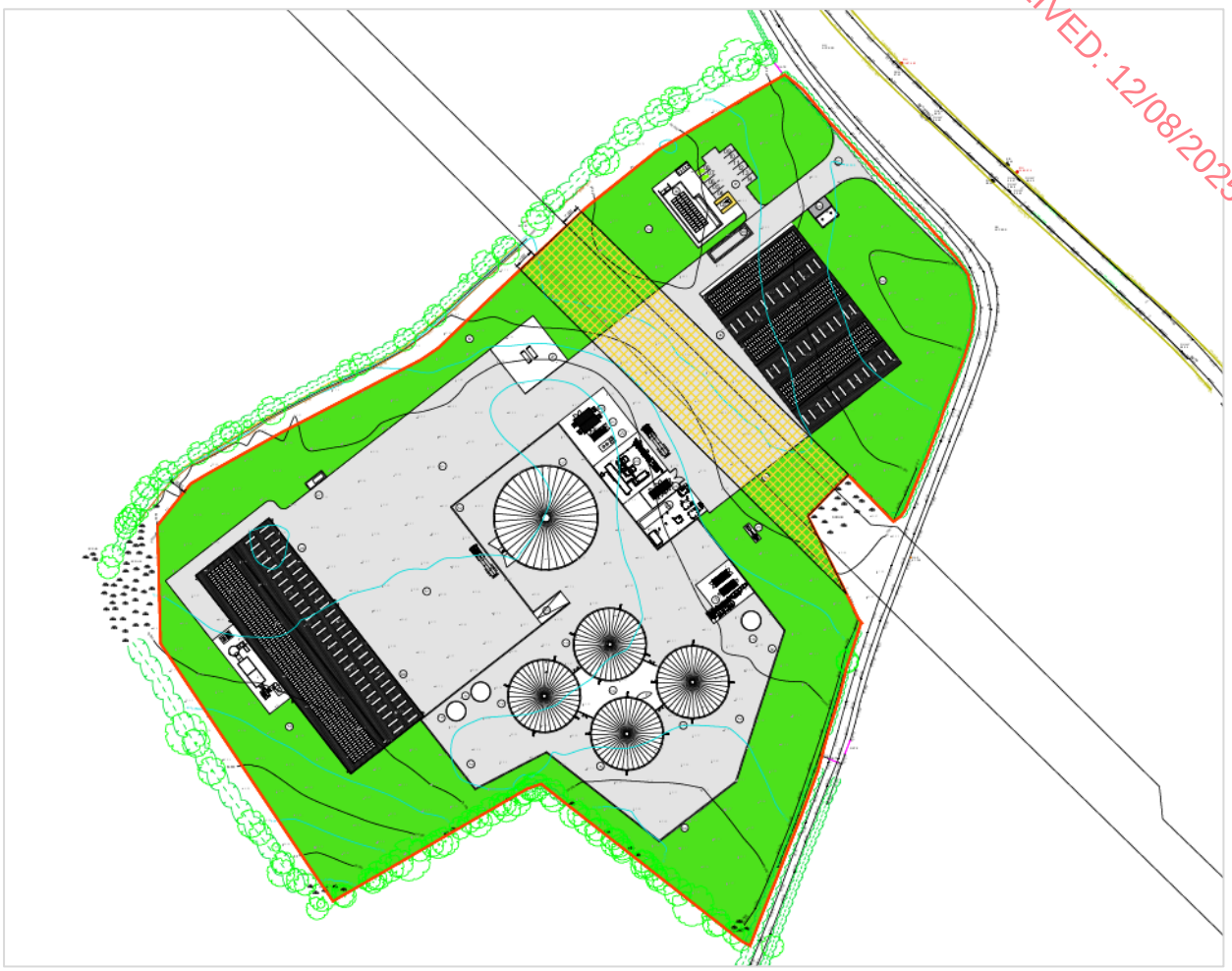

Figure 3.3: Concept Site Layout

Layout selection was an iterative process, with the objective of identifying a suitable layout that;

- Optimised the existing topography of the site in order to minimise excavation works.
- Optimised the existing topography of the site in order to minimise potential visual impacts on the local landscape.
- Optimised the layout of plant machinery on site to minimise impact of noise, odour on sensitive receptors i.e. applying distance and screening from buildings to ensure noise and odour levels are negligible of site.
- Met the design and operational requirements of DAFM guidance document CN11: Conditions for approval and operation of Biogas Plants transforming Animal By-Products and derived products in Ireland.
- Met the design and operational requirements of the EPA Industrial Emissions licencing.

The design of emissions stacks was considered throughout the design and planning process. Air dispersion modelling undertaken as part of the Air and Odour impact Assessment detailed in **Chapter 8: Air, Odour & Climate Change** informed the suitable height of the 1 No. CHP

stack, 1 no. Biomethane Boiler stack and 1 No. Odour Treatment stack.

The Concept Site Layout (**Figure 3.3**) was revised in order to co-locate pasteurisation tanks with Feedstock Reception Building (to allow venting to building & odour abatement system), provide additional area along the north, south, east and west boundary of the Proposed Development to be utilised for landscaping. In addition, the energy hub (CHP, Upgrader, BNEF etc) was relocated to the front of the site at sufficient distance to satisfy the buffer zone for existing GNI pipelines). The Silage Clamp was relocated to the west of the site to allow sufficient space for truck movements.

A landscape plan has been incorporated and accompanies the application (Document Ref: **25/C0/ORS/BKPL/001**). The landscape plan (**Figure 3.4**) offers short to long term buffering with and is specifically developed to assist in integrating the Proposed Development into its surrounds. In addition, native planting is proposed along the front boundary of the site at the entrance area, where any section of existing hedgerows will be removed to facilitate sightlines, a new hedgerow will be set back consisting of multiple native varieties. In addition, the proposed new hedgerow is to be continued within the site to further integrate biodiversity through the site and strengthen buffering effect. Relocation of buildings allowed for additional planting to be included as part of the final landscaping plans.

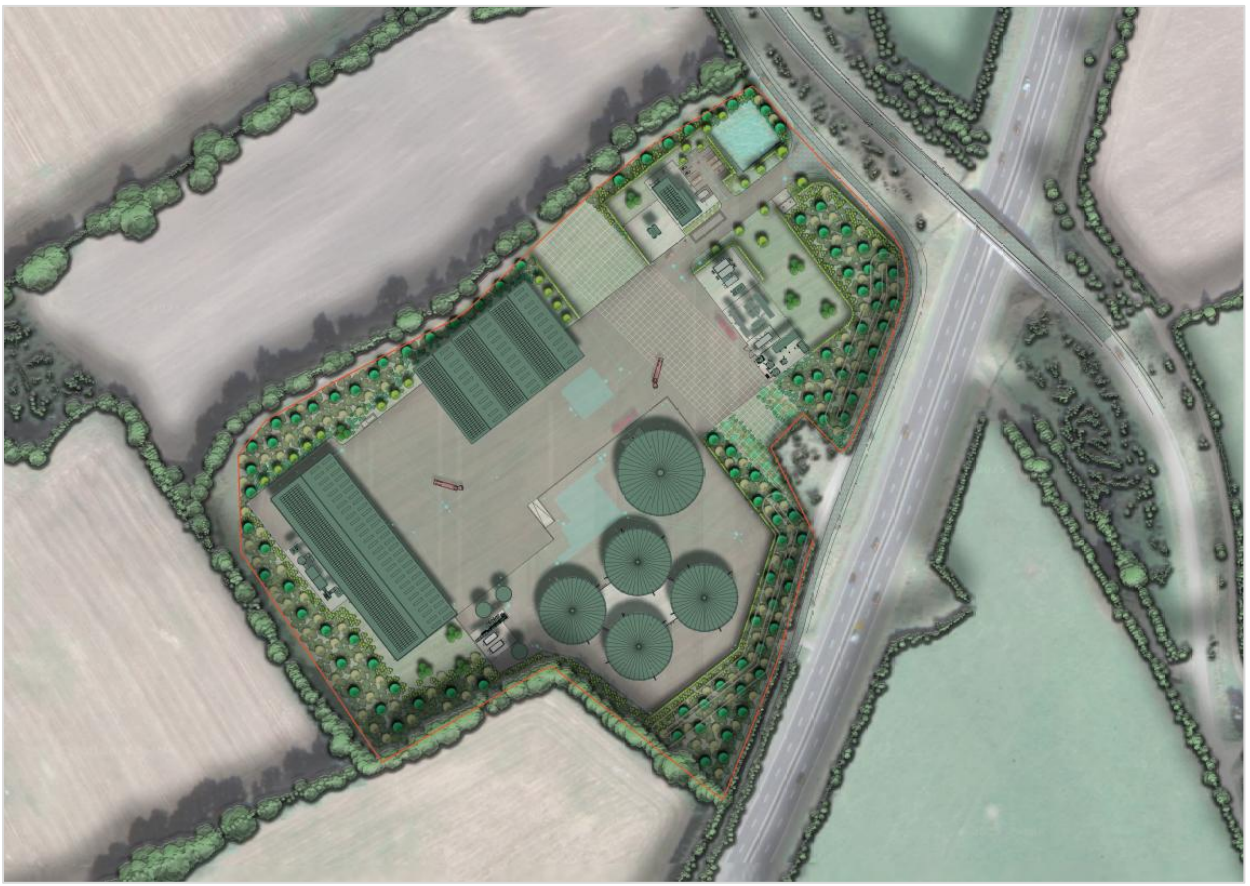

Figure 3.4: Extract from Landscape Plan (Document Ref: 25/C0/ORS/BKPL/001)

3.4.4 Consideration of Alternative Technical Configurations

Alternative Technical Configurations were considered as part of the design process of the Proposed Development.

There are several different process configurations around which AD systems may be designed. Factors considered when making design decisions included whether the process is 'batch' or 'continuous' feed, whether it is a 'dry' or 'wet' system, whether it is a 'single stage' or 'multi-stage' process and whether the anaerobic digester is operated at 'mesophilic' or 'thermophilic' temperatures.

3.4.4.1 Process Configuration

A Batch' Flow system involves the single addition of feedstock to a digester at the start of the process. When the feedstock has been placed in the digester, the unit is sealed for the duration of the process with no more material added. The process was ruled out as it is deemed unsuitable given the characteristics of the agricultural manures, slurries, food processing residues and crop-based feedstocks available locally.

In contrast, Continuously Stirred Tank Reactor (CSTR) systems have feedstock added consistently or in stages with substrate displaced as new material is added. A multi-stage CSTR anaerobic digestion system is chosen for the Proposed Development, providing primary and secondary digestion within suitably sized Digestion Tanks. In comparison to single stage systems, multi-stage CSTR anaerobic digestion systems provide greater process stability, increased energy efficacy and better control over crucial parameters such as temperature, mixing, and substrate concentration. CSTR systems are fed consistently resulting in a steady-state and a consistent biogas production rate.

3.4.4.2 Operating Temperature

It is proposed to operate the AD process at mesophilic temperature range (30°C – 40°C). Mesophilic digestion systems are generally more stable than thermophilic systems (50°C-60°C) because a wider diversity of bacteria grow at mesophilic temperatures and these bacteria are generally more robust and adaptable to changing environmental conditions.

Thermophilic digestion offers the advantages of faster reaction rates compared to mesophilic digestion, leading to shorter retention times. However, thermophilic systems require significant additional energy to maintain the higher operating temperatures which is considered contradictory to the sustainability goals of the proposed project. The additional heat demand would increase the volume of biomethane required to be used on site as a fuel for the CHP engine and boiler, thereby reducing the overall volume of biomethane available for export to the national gas network thereby reducing the positive environmental impact of the proposed development with regard to the displacement of fossil fuels.

3.4.4.3 Biogas Uses Considered

Biomethane

A number of options were considered for the utilisation of the biomethane produced from the AD process.

- On-site generation of electricity and heat using a Combined Heat and Power (CHP) plant.
- Injection of biomethane to the existing gas network for industrial, commercial, or residential use.

The Proposed Development is conceived to adopt both options above, as both electricity and heat are required to support the process and enable the production of biomethane. On-site generation of electricity and heat using a CHP plant is incorporated to ensure the Proposed Development can be self-sufficient in terms of electrical and thermal energy demand.

The Irish Government is committed to supporting delivery of up to 5.7TWh of indigenously produced biomethane by 2030. The National Biomethane Strategy published by the Department of Environment, Climate, and Communications and the Department of Agriculture, Food and the Marine on the 28th of May 2024, sets the primary objective to deliver on the ambitious target set by the Government as part of the agreement on the sectoral emission ceilings.

Considering the proximity of the Proposed Development to the existing gas network, injection of biomethane to the existing gas network for industrial, commercial, or residential use was deemed the most suitable option. The Grid Injection Unit (GIU) within the Proposed Development will allow for the direct injection of biomethane into the gas network. A distribution gas connection to the Proposed Development will be delivered separately by GNI under a separate consenting process (with this gas connection considered in this EIAR).

Biomethane supplied to the existing gas network in this manner will be used as a direct substitute for fossil gas in various applications, such as high-temperature heat, electricity generation and transport. The biomethane produced by the Proposed Development will therefore directly contribute to meeting the national target of 5.7TWh of indigenously produced biomethane by 2030. Furthermore, direct entry into the gas network is more efficient in terms of GHG emissions compared to virtual pipeline as no additional fuel is required for the transport of the renewable energy. Traffic is also less with the direct entry method as opposed to a virtual pipeline.

Biogenic CO_2

A CO_2 liquefaction system has been included within the Proposed Development. The biogenic CO_2 that is extracted during the biogas upgrading process can be captured and liquefied. By utilising this process, the biogenic CO_2 will be captured, purified, and reused.

3.4.4.4 Best Available Techniques (BAT)

The processes outlined in **Chapter 2: Project Description** were selected following a thorough review of Best Available Techniques (BAT) detailed below, site conditions, and regulatory requirements.

- Best Available Techniques (BAT) Waste Treatment - Commission Implementing Decisions (CID)
- Best Available Techniques (BAT) Reference Document for the Animal By-products and/or Edible Co-products Industries
- Best Available Techniques (BAT) Reference Document for Energy Efficiency
- Best Available Techniques (BAT) Reference Document Emissions from Storage

The chosen techniques and technologies are industry-standard, support the effective implementation of emission control measures, and are well-established and proven within the industry.

3.5 Conclusion

In conclusion, this chapter has thoroughly examined the practicable alternatives considered during the design and pre-application phases of the Proposed Development, in compliance with the legislative context and guidelines provided by the EIA Directive 2014/52/EU and the EPA. The methodology followed a structured approach, ensuring all reasonable alternatives were assessed with respect to their environmental impacts.

Detailed considerations were given to the 'Do Nothing' scenario, highlighting the significant environmental, economic, and social benefits that would be forfeited if the project were not implemented.

The chapter also detailed the alternative locations considered, using a comprehensive scoring matrix to evaluate site-specific criteria. By presenting a clear rationale for the selected option, this chapter underscores the careful and informed decision-making process that ensured environmental considerations were taken into account in deciding on the selected options.

Appendix 3.1: Site-Specific Selection Criteria and Assessment

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1. Site-Specific Selection Criteria and Assessment: Ballyvass, Co. Kildare

Criteria	Scoring	Score	Weighting	Total Score
Access to Gas Grid	1. Greater than 5km, 2. 1-5km, 3. <1km or adjacent to site	3	3	9
Access to Electricity Grid	1. Greater than 5km, 2. 1-5km, 3. <1km	2	1	2
Proximity to Feedstock Supply/Digestate receivers	1. 80% available >15km 2. 80% available within 15km 3. 80% Available within 5 km or adjacent to major source of feedstock.	2	3	6
Transport Network and Access	1. On local road with predominantly local roads network 2. On local road but with regional road network within 1-3km of the site 3. On regional road or less than 1km from Regional Road network. 4. Immediately adjacent to major source of feedstock allowing for transport internally.	2	3	6
Existing land use	1. Urban or greenfield 2. Rural Brownfield, 3. Zoned Industrial	1	2	2
Proximity to sensitive human receptors	1. Less than 250m. 2. less than 1km. 3. Greater than 1 km	1	3	3
Land Availability	1. Not for Sale or Lease 2. Available for Sale or Lease but financially unviable 3. Owned or for sale/lease at achievable price	3	3	9
Available Land Size	1. 1- 2ha 2. 2-3ha 3. Greater than 4ha	2	3	6

Landscape Sensitivity	1. Proximate to Sensitive Landscape 2. Greater than 1km 3. Greater than 5km	3	2	6
Landscape and Visual Amenity	1. Site is elevated or exposed 2. Site has existing cover and partial views 3. Site is hidden and with little or no receptors overlooking the site.	3	2	6
Topography	1. Undulating or severe level changes 2. Moderate level changes that can be engineered out. 3. Relatively flat and level.	3	2	6
Flood Risk	1. In a Flood Risk Zone 3. Outside Flood Risk Zone	3	3	9
Ecological Designations Score	1. Adjacent to designated site 2. >1km from designated sites 3. >5km from designated sites	3	2	6
Archaeological Designations Score	1.Adjacent to archaeology sites 2. >1km from archaeology sites 3. >5km from archaeology sites	1	1	1
Proximity to Suitable Water Course or sewer (for surface water discharge)	1. Greater than 1km 2. Less than 1km. 3. Immediately adjacent or on site	1	3	3
Proximity to Drinking Water Source/Aquifer	1. Less than 250m. 2. Less than 1km. 3. Greater than 1km	2	1	2
Total Ranked Score				**82**

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2. Site-Specific Selection Criteria and Assessment: Usk, Co. Kildare

Criteria	Scoring	Score	Weighting	Total Score
Access to Gas Grid	1. Greater than 5km, 2. 1-5km, 3. <1km or adjacent to site	3	3	9
Access to Electricity Grid	1. Greater than 5km, 2. 1-5km, 3. <1km	2	1	2
Proximity to Feedstock Supply/Digestate receivers	1. 80% available >15km 2. 80% available within 15km 3. 80% Available within 5 km or adjacent to major source of feedstock.	1	3	3
Transport Network and Access	1. On local road with predominantly local roads network 2. On local road but with regional road network within 1-3km of the site 3. On regional road or less than 1km from Regional Road network. 4. Immediately adjacent to major source of feedstock allowing for transport internally.	2	3	6
Existing land use	1. Urban or greenfield 2. Rural Brownfield, 3. Zoned Industrial	2	2	4
Proximity to sensitive human receptors	1. Less than 250m. 2. less than 1km. 3. Greater than 1 km	1	3	3
Land Availability	1. Not for Sale or Lease 2. Available for Sale or Lease but financially unviable 3. Owned or for sale/lease at achievable price	1	3	3
Available Land Size	1. 1- 2ha 2. 2-3ha 3. Greater than 4ha	3	3	9

Landscape Sensitivity	1. Proximate to Sensitive Landscape 2. Greater than 1km 3. Greater than 5km	2	2	4
Landscape and Visual Amenity	1. Site is elevated or exposed 2. Site has existing cover and partial views 3. Site is hidden and with little or no receptors overlooking the site.	2	2	4
Topography	1. Undulating or severe level changes 2. Moderate level changes that can be engineered out. 3. Relatively flat and level.	3	2	6
Flood Risk	1. In a Flood Risk Zone 3. Outside Flood Risk Zone	3	3	9
Ecological Designations Score	1. Adjacent to designated site 2. >1km from designated sites 3. >5km from designated sites	3	2	6
Archaeological Designations Score	1.Adjacent to archaeology sites 2. >1km from archaeology sites 3. >5km from archaeology sites	3	1	3
Proximity to Suitable Water Course or sewer (for surface water discharge)	1. Greater than 1km 2. Less than 1km. 3. Immediately adjacent or on site	1	3	3
Proximity to Drinking Water Source/Aquifer	1. Less than 250m. 2. Less than 1km. 3. Greater than 1km	1	1	1
Total Ranked Score				**75**

3. Site-Specific Selection Criteria and Assessment: Meville, Colbinstown, Co. Kildare

Criteria	Scoring	Score	Weighting	Total Score
Access to Gas Grid	1. Greater than 5km, 2. 1-5km, 3. <1km or adjacent to site	2	3	6
Access to Electricity Grid	1. Greater than 5km, 2. 1-5km, 3. <1km	2	1	2
Proximity to Feedstock Supply/Digestate receivers	1. 80% available >15km 2. 80% available within 15km 3. 80% Available within 5 km or adjacent to major source of feedstock.	2	3	6
Transport Network and Access	1. On local road with predominantly local roads network 2. On local road but with regional road network within 1-3km of the site 3. On regional road or less than 1km from Regional Road network. 4. Immediately adjacent to major source of feedstock allowing for transport internally.	1	3	3
Existing land use	1. Urban or greenfield 2. Rural Brownfield, 3. Zoned Industrial	1	2	2
Proximity to sensitive human receptors	1. Less than 250m. 2. less than 1km. 3. Greater than 1 km	1	3	3
Land Availability	1. Not for Sale or Lease 2. Available for Sale or Lease but financially unviable 3. Owned or for sale/lease at achievable price	2	3	6
Available Land Size	1. 1- 2ha 2. 2-3ha 3. Greater than 4ha	3	3	9

Landscape Sensitivity	1. Proximate to Sensitive Landscape 2. Greater than 1km 3. Greater than 5km	2	2	4
Landscape and Visual Amenity	1. Site is elevated or exposed 2. Site has existing cover and partial views 3. Site is hidden and with little or no receptors overlooking the site.	2	2	4
Topography	1. Undulating or severe level changes 2. Moderate level changes that can be engineered out. 3. Relatively flat and level.	3	2	6
Flood Risk	1. In a Flood Risk Zone 3. Outside Flood Risk Zone	1	3	3
Ecological Designations Score	1. Adjacent to designated site 2. >1km from designated sites 3. >5km from designated sites	2	2	4
Archaeological Designations Score	1.Adjacent to archaeology sites 2. >1km from archaeology sites 3. >5km from archaeology sites	1	1	1
Proximity to Suitable Water Course or sewer (for surface water discharge)	1. Greater than 1km 2. Less than 1km. 3. Immediately adjacent or on site	1	3	3
Proximity to Drinking Water Source/Aquifer	1. Less than 250m. 2. Less than 1km. 3. Greater than 1km	1	1	1
Total Ranked Score				**63**

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4. Site-Specific Selection Criteria and Assessment: Paulstown, Co. Kilkenny

Criteria	Scoring	Score	Weighting	Total Score
Access to Gas Grid	1. Greater than 5km, 2. 1-5km, 3. <1km or adjacent to site	2	3	6
Access to Electricity Grid	1. Greater than 5km, 2. 1-5km, 3. <1km	2	1	2
Proximity to Feedstock Supply/Digestate receivers	1. 80% available >15km 2. 80% available within 15km 3. 80% Available within 5 km or adjacent to major source of feedstock.	2	3	6
Transport Network and Access	1. On local road with predominantly local roads network 2. On local road but with regional road network within 1-3km of the site 3. On regional road or less than 1km from Regional Road network. 4. Immediately adjacent to major source of feedstock allowing for transport internally.	3	3	9
Existing land use	1. Urban or greenfield 2. Rural Brownfield, 3. Zoned Industrial	1	2	2
Proximity to sensitive human receptors	1. Less than 250m. 2. less than 1km. 3. Greater than 1 km	1	3	3
Land Availability	1. Not for Sale or Lease 2. Available for Sale or Lease but financially unviable 3. Owned or for sale/lease at achievable price	2	3	6
Available Land Size	1. 1- 2ha 2. 2-3ha 3. Greater than 4ha	2	3	6

Landscape Sensitivity	1. Proximate to Sensitive Landscape 2. Greater than 1km 3. Greater than 5km	1	2	2
Landscape and Visual Amenity	1. Site is elevated or exposed 2. Site has existing cover and partial views 3. Site is hidden and with little or no receptors overlooking the site.	1	2	2
Topography	1. Undulating or severe level changes 2. Moderate level changes that can be engineered out. 3. Relatively flat and level.	2	2	4
Flood Risk	1. In a Flood Risk Zone 3. Outside Flood Risk Zone	1	3	3
Ecological Designations Score	1. Adjacent to designated site 2. >1km from designated sites 3. >5km from designated sites	3	2	6
Archaeological Designations Score	1.Adjacent to archaeology sites 2. >1km from archaeology sites 3. >5km from archaeology sites	2	1	2
Proximity to Suitable Water Course or sewer (for surface water discharge)	1. Greater than 1km 2. Less than 1km. 3. Immediately adjacent or on site	2	3	6
Proximity to Drinking Water Source/Aquifer	1. Less than 250m. 2. Less than 1km. 3. Greater than 1km	2	1	2
Total Ranked Score				**67**

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5. Site-Specific Selection Criteria and Assessment: Clogheen, Co. Tipperary

Criteria	Scoring	Score	Weighting	Total Score
Access to Gas Grid	1. Greater than 5km, 2. 1-5km, 3. <1km or adjacent to site	1	3	3
Access to Electricity Grid	1. Greater than 5km, 2. 1-5km, 3. <1km	2	1	2
Proximity to Feedstock Supply/Digestate receivers	1. 80% available >15km 2. 80% available within 15km 3. 80% Available within 5 km or adjacent to major source of feedstock.	3	3	9
Transport Network and Access	1. On local road with predominantly local roads network 2. On local road but with regional road network within 1-3km of the site 3. On regional road or less than 1km from Regional Road network. 4. Immediately adjacent to major source of feedstock allowing for transport internally.	2	3	6
Existing land use	1. Urban or greenfield 2. Rural Brownfield, 3. Zoned Industrial	1	2	2
Proximity to sensitive human receptors	1. Less than 250m. 2. less than 1km. 3. Greater than 1 km	1	3	3
Land Availability	1. Not for Sale or Lease 2. Available for Sale or Lease but financially unviable 3. Owned or for sale/lease at achievable price	3	3	9
Available Land Size	1. 1- 2ha 2. 2-3ha 3. Greater than 4ha	2	3	6

Landscape Sensitivity	1. Proximate to Sensitive Landscape 2. Greater than 1km 3. Greater than 5km	3	2	6
Landscape and Visual Amenity	1. Site is elevated or exposed 2. Site has existing cover and partial views 3. Site is hidden and with little or no receptors overlooking the site.	2	2	4
Topography	1. Undulating or severe level changes 2. Moderate level changes that can be engineered out. 3. Relatively flat and level.	3	2	6
Flood Risk	1. In a Flood Risk Zone 3. Outside Flood Risk Zone	3	3	9
Ecological Designations Score	1. Adjacent to designated site 2. >1km from designated sites 3. >5km from designated sites	3	2	6
Archaeological Designations Score	1.Adjacent to archaeology sites 2. >1km from archaeology sites 3. >5km from archaeology sites	1	1	1
Proximity to Suitable Water Course or sewer (for surface water discharge)	1. Greater than 1km 2. Less than 1km. 3. Immediately adjacent or on site	2	3	6
Proximity to Drinking Water Source/Aquifer	1. Less than 250m. 2. Less than 1km. 3. Greater than 1km	2	1	2
Total Ranked Score				**80**