3 Alternatives

3.1 Introduction

This chapter provides a description of the reasonable alternatives studied by Indaver, which are relevant to the proposed Site Sustainability Project (hereinafter referred to as the proposed development) and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transpose the requirements of Directive 2014/52/EU (the EIA Directive) on the assessment of the effects of private projects on the environment into national law require that information provided in the Environmental Impact Assessment Report (EIAR) shall include a description of the reasonable alternatives studied by the developer.

These are reasonable alternatives which are relevant to the project and its specific characteristics and must also indicate the main reasons for the option chosen taking into account the effects of the project on the environment and may relate to matters such as project design, technology, location, size and scale as set out in Annex IV (2) of the 2014 Directive and Schedule 6(2)(b) to the 2018 EIA Regulations.

Section 3.2 below presents the legislative framework and guidance which has been considered during the preparation of this chapter. **Sections 3.3** (*Alternative Sites*), **3.4** (*Alternative Processes*) and **3.5** (*Alternative Designs*) present the alternatives (and comparison of environmental effects, where relevant) that were considered by Indaver.

Chapter 2 of this EIAR, ***Policy and Planning Framework and Need for the Scheme***, should be read in conjunction with the assessment on alternatives below as the analysis contained therein is relevant in the context of the reasoning applied in the assessment of alternatives carried out in this Chapter and informs the reasoning applied throughout. In this context, the Do-Nothing Scenario (Do-Nothing Alternative) (in terms of reinforcing the Need for the Scheme) is discussed in **Section 3.6** below.

For clarity, the Do-Nothing Scenario (i.e. a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline 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) is provided in a number of chapters of the EIAR. Refer to **Chapters 6-17** and also **Chapter 19** of this EIAR for further details.

3.2 Legislative Framework

3.2.1 Background

The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transpose the requirements of Directive 2014/52/EU (the EIA Directive) on the assessment of the effects of private projects on the environment into national law require that information provided in the Environmental Impact Assessment Report (EIAR) shall include a description of the reasonable alternatives studied by the developer.

Annex 5(1) of the 2014 Directive now provides that the EIAR shall contain:

> "*1d) 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*".

Furthermore, Annex IV states that the EIAR shall contain:

> " *a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects".*

Thus, these are reasonable alternatives which are relevant to the project and its specific characteristics and must also indicate the main reasons for the option chosen taking into account the effects of the project on the environment and may relate to matters such as project design, technology, location, size and scale.

The amended EIA Directive requires that the environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the prescribed environmental factors which include:

a) population and human health;

b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;

c) land, soil, water, air and climate;

d) material assets, cultural heritage and the landscape;

e) the interaction between the factors referred to in points (a) to (d).

These prescribed factors in relation to the proposed development are considered in each of the relevant Chapters of this EIAR as appropriate.

With the above legislative framework in mind, this Alternatives Chapter of the EIAR has been prepared in accordance with the European Union EIA Directive 85/337/EC as amended by Directive 2014/52/EU and the European Union

(Planning and Development) Environmental Impact Assessment) Regulations 2018.

Moreover, it has similarly been prepared in accordance with a suite of guidance documents at national and European level aimed at assisting in the interpretation of the amended EIA Directive and the new transposing regulations as detailed in full below and pertaining to the assessment of alternatives that may be considered as reasonable.

3.2.2 Guidance Documents

In carrying out an assessment of reasonable alternatives relevant to the proposed developments, a systematic and stringent approach has been adopted with a view to fulfilling the legislative obligations as described above and in order that the requirements therein are adhered to in full.

In this regard, consideration was given to a number of guidance documents in the preparation of this chapter of the EIAR. The table below sets out the relevant key EIA Guidance which has been consulted in the preparation of this chapter.

All such guidance and documentation have informed the assessment of reasonable alternatives as carried out and detailed in this chapter of the EIAR.

- Department of Housing, Planning and Local Government (2018) Circular PL 05/2018 -Transposition into Planning Law of Directive 2014/52/EU amending Directive 2011/92/EU on the effects of certain public and private projects on the environment (the EIA Directive) And Revised Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment;
- Department of Housing, Planning, Community and Local Government (2017) Key Issues Consultation Paper on the Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems;
- Department of Housing, Planning, Community and Local Government (2017) Circular PL 1/2017 - Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive): Advice on the Administrative Provisions in Advance of Transposition;
- Environmental Protection Agency (2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft August 2017);
- European Commission (2017) Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report;
- Government of Ireland (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).

3.2.3 Examination of Alternatives

Taking into account the above guidance framework, it is important to highlight what is underscored therein regarding the interpretation to be applied as to what constitutes a reasonable alternative in practice, the selection of alternatives in terms of feasibility and the requisite level of detail to be provided in the assessment of any reasonable alternatives to the proposed developments to be carried out.

There is limited European and national guidance on what constitutes a 'reasonable alternative'. It is noteworthy however, that the aforementioned European Commission guidance document (2017) states that reasonable alternatives:

> *"Reasonable Alternatives must be relevant to the proposed Project and its specific characteristics, and resources should only be spent assessing these Alternatives. In addition, 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……. Ultimately, Alternatives have to be able to accomplish the objectives of the Project in a satisfactory manner, and should also be feasible in terms of technical, economic, political and other relevant criteria'.*

The European Commission guidance also states that:

> *"The feasibility of the Alternatives proposed can be determined on a case-by-case basis. The final set of reasonable Alternatives identified will then undergo a detailed description and assessment in the EIA Report….. It should be noted that each Project and each EIA is different, and there can be no definitive list prescribing how Alternatives are to be identified and assessed…….*
>
> *In some cases, Alternatives will have been developed at the plan stage (e.g. a plan for the transport sector, a regional development plan, or a spatial plan) or by the Developer during the Project's initial design. In such cases, some Alternatives may have already been excluded, in which case, it would likely be unnecessary to consider them again".*

On environmental considerations and the level of detail to be provided, the EPA guidance (draft August 2017) notes that a mini EIA of each alternative is not required:

> *"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 key issues associated with each, showing how environmental considerations were taken into account in deciding on the*

selected option. A detailed assessment (or mini EIA) of each alternative is not required".

Pursuant to section 3.4.1 of the EPA guidance, the consideration of alternatives also needs to be cognisant of the fact that:

"in some instances some of the alternatives described below will not be applicable – e.g. there may be no relevant 'alternative location'…"

Taking the foregoing guidance and legislative framework into account, the alternatives in relation to this proposed development are considered in terms of alternative site locations **(Section 3.3)**, alternative processes **(Section 3.4)**, and alternative layouts **(Section 3.5)** at the preferred site and a 'do-nothing' alternative **(Section 3.6)**.

3.3 Alternative Sites

In order to assess whether alternative sites should be considered as reasonable alternatives to the existing Indaver site at Carranstown where the proposed development will be carried out, it was necessary to commence any such consideration with an examination of the existent and established use, the planning history and context of the site and the overarching policy and planning framework relevant to the site and surrounding area.

The assessment must necessarily also consider the feasibility of all such alternatives and it should be noted that the selection of alternatives is limited in terms of feasibility and most notably must be feasible in terms of technical, economic, political and other relevant criteria as stated in the European Commission (2017) guidance document as detailed above.

Moreover, in conducting such an assessment of alternative sites, the concept of reasonableness must be applied throughout and whilst no legal definition of this concept is provided in the aforementioned legislative framework, applying the ordinary rules of statutory interpretation, the meaning to be ascribed may be said to be fundamentally dependent on the particular facts relevant to the proposed developments at hand.

Thus, a common sense approach has been applied throughout the assessment process in order to determine if alternatives sites may be regarded as reasonable or warranted in the present instance and applies the reasoning outlined in **Chapter 2** ***Policy and Planning Framework and Need for the Scheme*** of this EIAR which details fully the national and regional planning policy framework applicable to the proposed developments.

3.3.1 Planning History and Existent Site Use

With regard to the existent use of the Carranstown site, the Indaver Waste to Energy facility at Carranstown constitutes a strategic infrastructure development within the meaning of section 37A of the Planning and Development Act 2000, as amended (Ref. PL17.PA0026) as granted by An Bord Pleanála in 2013 (and as detailed in full in **Chapter 2** ***Policy and Planning Framework and Need for the***

Scheme of this EIAR) thus altering the previous planning permission as granted by Meath County Council.

The now enduring planning history of the existent site including a number of subsequent and ancillary amendments (by PL17.PM0004 and PL17.PM0007) as granted by An Bord Pleanála serve to demonstrate that the proposed development to be carried out at the site represent the optimal choice for extending the activities on site.

Consequently and taking into account the planning permission attached to the existent site and approval of a number of subsequent amendments, the proposed development as an extension of the same may be regarded as being in line with the established land use pattern within the area and by implication may now be regarded as a de facto and established use.

However, the aspect of the proposed development involving the rebuilding of the existing modular office building and re-building of same with a new single storey permanent office and staff welfare building may be differentiated from the above.

Whilst this element of the proposed development is not significant in nature and involves only minimal changes, it is nonetheless in line with the existing planning permission as per 17.PA0026 relating to the existing modular office building.

As such, this aspect of the proposed development is compatible with the existing zoning and planning permission relating to the Carranstown site and may thus be regarded as ancillary to the existing operation of the site.

In addition, the Eastern Midlands Regional Waste Management Plan 2015 -2021 supports the development of up to 50,000 tonnes of additional thermal recovery capacity for the treatment of hazardous wastes nationally to ensure that there is adequate active and competitive treatment in the market to facilitate self-sufficiency needs where it is technically, economically and environmentally feasible. A number of elements of the proposed development regarding the treatment of additional hazardous waste and residues may be regarded as the most sustainable option as the same will facilitate the continued treatment of hazardous waste which is in line with the dual national policy objectives of self-sufficiency and proximity.

The Waste Plan for the region also provided that all proposals for waste management development must meet the Environmental Protection Criteria set out in the Plan. In this regard and also relevant to the Development Plan’s requirements, the facility has since the commencement of operations, being governed pursuant to an operating licence (Ref: W0167-03) as granted by the Environmental Protection Agency (EPA).

Thus, stringent licence requirements giving effect to the requirements of the Industrial Emissions Directive (IED) which consolidates the requirements of the Large Combustion Plant Directive (LCPD), the Waste Incineration Directive (WID) and the Integrated Pollution Prevention and Control (IPPC) Directive which strengthens the application of Best Available Techniques (BAT) must be adhered to on an ongoing basis in the context of the existent activities carried out

at the site. This permitting and oversight regime will also apply to the proposed development to be carried out at the Carranstown site.

In a similar vein, the Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland Region 2019 -2031 designed to provide regional level strategic planning and economic policy in support of the implementation of the National Planning Framework seeks to provide infrastructure and services in a sustainable plan and infrastructure-led manner to ensure the sustainable management of water, waste and other environmental resources in the region. It also commits the Eastern Midland Region to implementing the provisions of the Eastern Midland Regional Waste Management Plan 2015-2021.

In light of the foregoing, the existent site may be said to have an established use of waste management since 2006 (planning permission was granted by Meath County Council) and is now part of the essential waste recovery infrastructure of the area and may therefore from a planning policy perspective be regarded as the most reasonable site to carry out the proposed development. It may also be regarded as the most reasonable option in terms of feasibility.

From a licensing perspective, the existent site also may also be regarded as the most reasonable and feasible option given the ongoing stringent nature of regulation that applies in the context of the site's current activities.

3.3.2 Overarching Policy Framework

In addition to the planning policies referred to above, a review of the overarching waste and planning policy framework also (as detailed in full in **Chapter 2** ***Policy and Planning Framework and Need for the Scheme*** of this EIAR) serves to demonstrate that the existent site represents the most reasonable and feasible choice for the proposed development to be carried out.

From a national planning policy perspective, the National Planning Framework (NPF) and associated National Development Plan (NDP) provide that planning for waste treatment requirements to 2040 will require the development of necessary and appropriate hazardous waste management facilities to avoid the need for treatment elsewhere.

The Plans also underline that investment in waste management infrastructure is critical to Ireland's environmental and economic well-being for a growing population and to achieving circular economy and climate objectives and further notes that to date the infrastructure to deliver waste management policy has been largely delivered through private investment.

In addition, from a waste policy perspective, the National Hazardous Waste Management Plan, the Regional Spatial and Economic Strategy (RSES) for the Eastern Midlands Region and the Regional Waste Management Plan for the Eastern Midlands Region all underline the need for hazardous waste treatment infrastructure on a national basis.

The National Hazardous Waste Management Plan 2014–2020 and the 2018 Progress Report on its implementation underline in clear terms the need to strive for improved self-sufficiency in the management of hazardous wastes in the State.

The Plan also provides that there is a need to address the deficit in thermal treatment capacity in Ireland (i.e. use as fuel, co-incineration or incineration) for Irish wastes currently being exported and also states that consideration should be given to co-location of hazardous waste treatment at existing waste facilities or brownfield sites for the purposes of sustainability and land-use planning.

As such, the co-location of hazardous waste treatment and associated infrastructure at the existing waste facility at Carranstown where the proposed development will treat additional volumes of hazardous waste and residues, may be regarded as being consistent with this policy objective of the Plan and may therefore be regarded as the most practical and reasonable solution given that the existent site is designed to treat municipal and hazardous waste pursuant to licence number W0167-03 as granted by the EPA.

In addition, the Environmental Protection Agency Progress Report on the implementation of the National Hazardous Waste Management Plan 2014 - 2020[1] also specifies that there is a continued need to strive for self-sufficiency in the management of hazardous waste in the State.

It specifically states in this regard that Ireland's self-sufficiency for the environmentally sound management of hazardous waste is contingent upon commercial decisions taken by private sector service providers regarding the provision of infrastructure for hazardous waste:

> '*While the introduction of economic and other instruments to provide incentives to potential investors remains under consideration, Ireland's self-sufficiency for the environmentally sound management of hazardous waste is contingent upon commercial decisions taken by private sector service providers regarding the provision of infrastructure for hazardous waste'*.[2]

The above policies when combined the Eastern Midland Regional Waste Plan's policy which identifies a need for up to 50,000 tonnes of additional thermal recovery capacity for the treatment of hazardous wastes nationally to ensure that there is adequate active and competitive treatment in the market to facilitate self-sufficiency needs, further enhance the finding that the existent site provides the optimum solution for carrying out the proposed developments.

As such, the treatment of additional hazardous waste, hazardous residues and the development of a dedicated tank farm at the existent site may be regarded as being fully compatible with the requirements of the above policy framework.

The element of the proposed development regarding the development of a hydrogen generation unit for connection to the gas distribution network and for use in mobile transport applications equally accords with the existing policy framework at national and regional level which underlines the pressing need to

[1] http://www.epa.ie/pubs/reports/waste/haz/EPA_NationalHazardousWasteManagementPlan_web.pdf
[2] Progress Report National Hazardous Waste Management Plan, Infrastructure and Self-Sufficiency Section at page 20

facilitate the development of enhanced electricity and gas supplies in order to support the State's transition to a low carbon economy.

This need is underlined in the National Planning Framework, the National Development Plan, the Regional Spatial and Economic Strategy for the Eastern Midlands Region and in the Meath County Development Plan. The use of this versatile technology in mobile transport applications further accords with the developing policy landscape on sustainability mobility as underlined in national and regional policy positions.

3.3.3 Economic Considerations

Moreover from an economic perspective the extension of activities at the existent site may also be regarded as the most practical and reasonable option for the proposed development as the same will provide economy of scale that cannot be replicated at alternative sites. In this regard, the technology required for the proposed developments is already present at the existent site. Crucially, the existing plant and equipment at the Carranstown site has the capacity to treat increased quantities of hazardous waste and residues.

Furthermore, the necessary associated infrastructure including the turbine, pipelines, foul and surface water infrastructure etc. necessary for day-to-day operational activities are also present at the existent site.

Thus, the consideration of alternative sites or processes may not be said to be economically justified or feasible when the above numerous and important factors are considered. Additionally, the existent site and the surrounding area have the environmental capacity to accommodate the proposed development without any significant risk of impact upon environmental sensitivities due to the site location as the existent facility has been operating pursuant to a now long established planning and licensing precedent.

The delivery of the proposed development, and associated processes on a new site would require the development of already existent infrastructure and constructing supporting infrastructure and would require an unnecessary duplication of resources which may only be regarded as uneconomical and unreasonable in the circumstances and equally cannot be regarded as an environmentally sound option.

Thus, the assessment of alternatives to treat such hazardous waste at sites other than the existent Carranstown site may not be regarded as reasonable when the above extensive policy framework is considered and applied to the present proposed developments.

As such, the extension of activities to be carried out at the Carranstown in the form of the proposed development is considered to be most optimum choice when the planning history of the site is taken into account, the existent and long established waste management use and adherence to the overarching waste and planning policy framework at regional and national level.

The existent site is therefore considered to be the preferred/optimum site based on the foregoing significant rationale.

Therefore, having considered the planning history of the existent site, the applicable planning law and policy framework, the comprehensive waste, energy and climate change policy framework, the existent waste management processes carried out at the facility, the characteristics of the proposed development to be carried out and a do-nothing alternative, there are no reasonable alternatives to the existent Carranstown site.

3.3.4 Overview of Relevant Criteria

Environmental Rationale
• Existent facility licence giving effect to stringent requirements as laid down in the Industrial Emissions Directive (IED)
• Avoided emissions through the treatment of additional hazardous waste at an existent facility
• Avoidance of the use of a greenfield site
• Avoidance of the duplication of resources and associated impacts
• Capacity to minimize potential impacts to sensitive receptors
• Existing ground conditions
• Existing site services that can accommodate the proposed developments

Technical Criteria
• Existent proven technology and processes
• Existing authorisation to accept waste and existing processing capacity
• Sufficient power available and at the correct voltage
• Existing trained and experienced personnel.

Development, Infrastructure and Economic Criteria
• Existent planning permission for strategic infrastructure
• Extension of activities at the existent site will provide an economy of scale that cannot be replicated at an alternative site
• Site location is in compliance with an established land use pattern as recognized in the site planning history and in the Meath County Development Plan
• Existent site access and local and regional road network capacity
• Existent access to foul and storm water infrastructure etc.

3.3.5 Alternative Locations on the Existent Site

3.3.5.1 Overview

After the foregoing assessment was carried out, it was then necessary to consider if any elements of the proposed development should be carried out at an alternative location within the existent Carranstown site.

Alternative locations for the following three main elements of the proposed development were screened individually based on specific criteria for each element:

1. Tank farm;
2. Hydrogen generation unit;
3. Bottom ash storage building.

The outcome of each screening option was then compared with each other based on a further set of criteria in order to provide the most optimal result. The other ancillary elements such as the warehouse, workshop and truck parking areas were then integrated into the outcome of this exercise.

Five possible areas on site were identified to accommodate the above developments. Each area was labelled alphabetically (A, B, F, I & J) and each development numbered 1 to 3 as per the list above. The five areas are briefly described below and their locations are shown below in **Figure 3.1**.

Area A

Flat green area to the rear of the existing ammonia and fuel oil storage tanks. This area is also adjacent to the Western boundary of the site.

Area B

Towards the Northern corner of the site. This area partially covered by a grassed-earthern berm and the other part comprises a compacted stone area.

Area F

A flat stoned area to the north-east of the existing office accommodation (and to the east of the 110kV power lines traversing the site) in the contractors compound. This area is partially covered by a large grassed-earthen berm to the north.

Area I

Flat, compacted stone area to the north-east of the existing staff car park. This area is to the east of the wayleave for the underground gas transmission main and the landscaped berm at the site boundary with the R152.

Area J

Narrow strip of land between the roadway and adjacent to the eastern external wall of the bunker and tipping hall area. This area is consists of a grassed-earthen berm which accommodates the local gradients between the roadway and the tipping hall entrance.

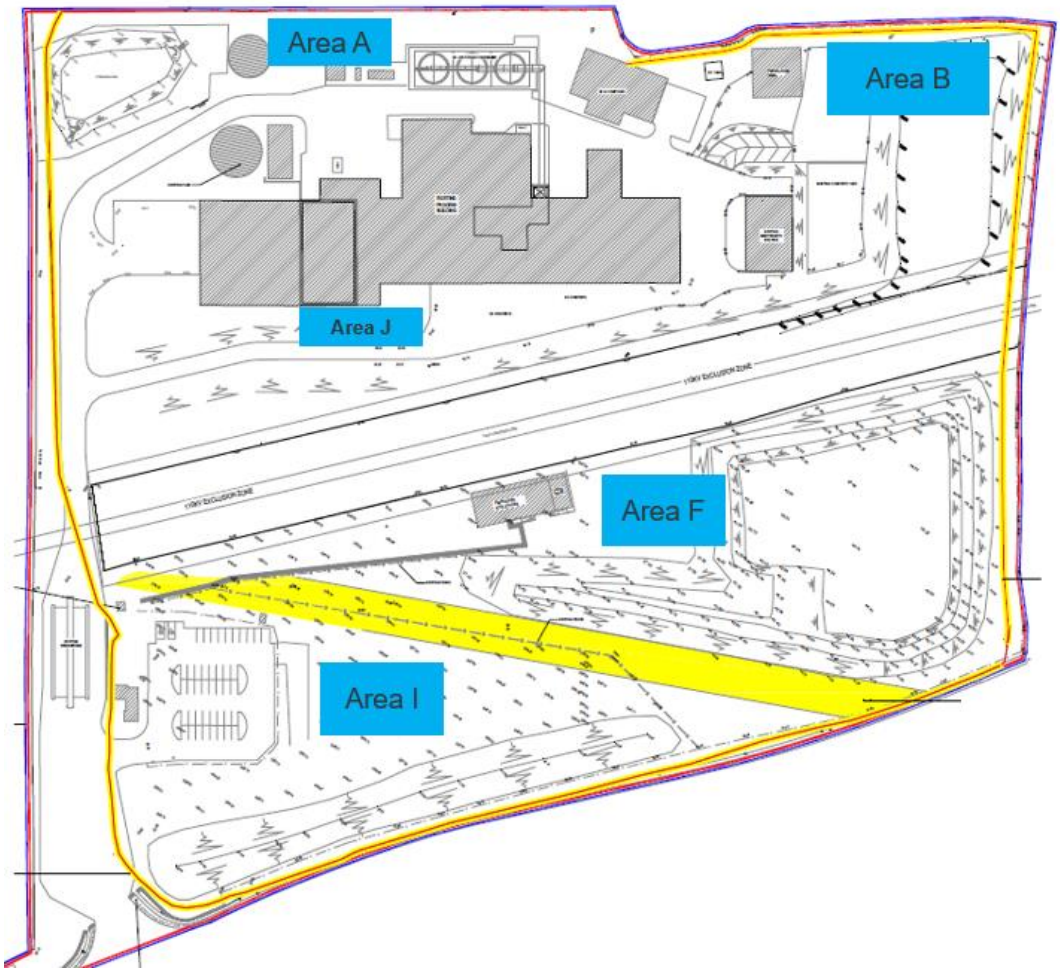

Figure 3.1 Five alternative locations identified for the proposed development

3.3.5.2 Tank Farm (Element 1)

Three alternative locations on site (A, B and J) were considered to locate the tank farm (denoted for element 1 as 1A, 1B & 1J in **Figure 3.2** below) with the main criteria being:

- the availability of space on site
- constructability (in the context of constructing on a fully operational site)
- the proximity to the existing tanker unloading area
- proximity to the ultimate treatment point in the furnace.

The three locations considered for the tank farm are shown in **Figure 3.2** below.

Figure 3.2 Three alternative locations considered for tank farm

3.3.5.3 Based on the criteria identified, Area J was ruled out as a possibility mainly due to space restrictions and constructability.Hydrogen Generation Unit (Element 2)

Three alternative locations on site (Areas B, F and I) were considered to locate the hydrogen generation unit with the main criteria being:

- the availability of space on site
- proximity to electrical supply and feed into the gas main
- compatibility of associated traffic movements with existing site activities.

The three locations for the hydrogen generation unit are shown in **Figure 3.3** below.

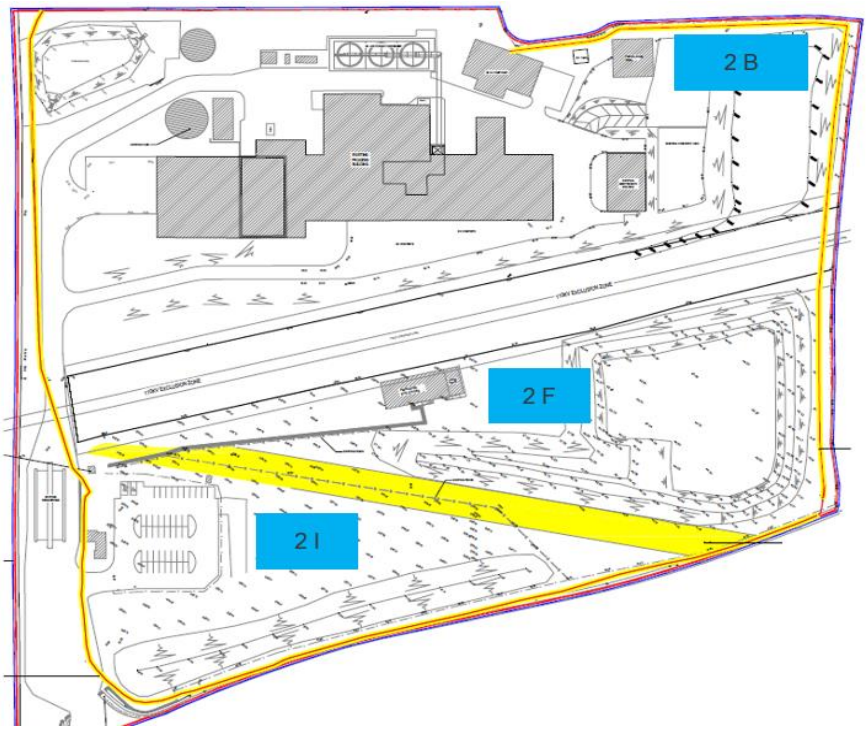

Figure 3.3 Three alternative locations considered for the HGU

Based on the criteria selected, sites 2B and 2F were deemed suitable and site 2I was ruled out due to the distance from the power supply.

3.3.5.4 Bottom Ash Storage Building (Element 3)

Three alternative locations on site (Areas B, F and I) were considered to locate the bottom ash storage building with the main criteria being:

- the availability of space on site
- proximity to existing bottom ash hall.

The three locations for the bottom ash storage building are shown in **Figure 3.4** below.

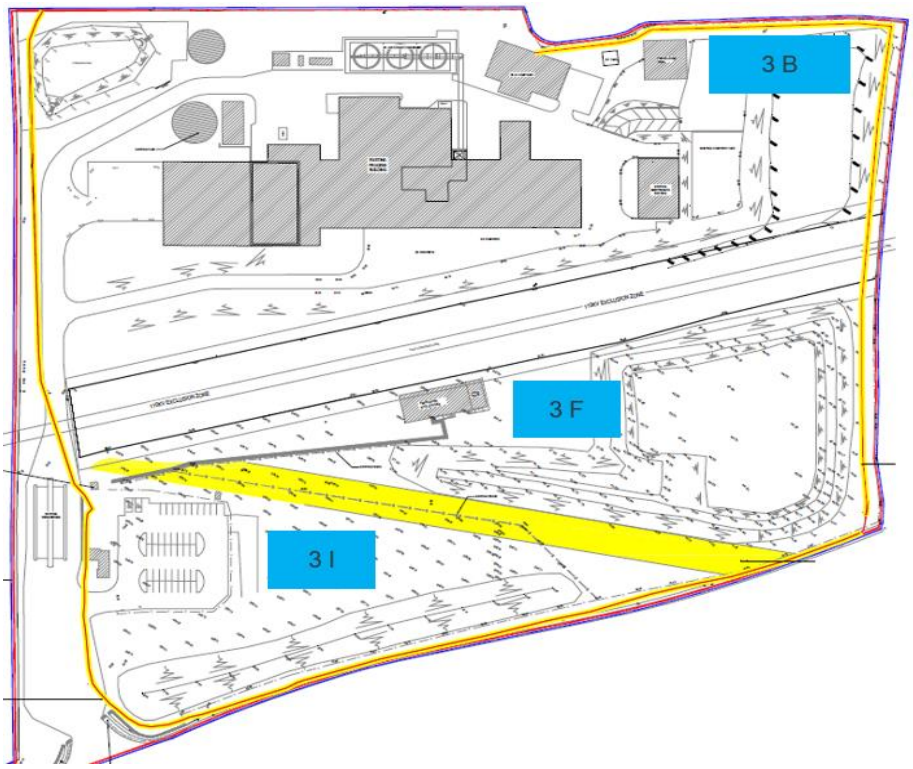

Figure 3.4 Three alternative locations considered for Bottom Ash Storage Building

Based on the criteria selected, sites 3B & 3F were deemed suitable and site 3I was ruled out as not only was it the furthest distance from the existing bottom ash hall, but also that outgoing vehicles would not easily be able to cross the weighbridge on site and would add un-necessary traffic movements to the site.

This exercise identified that there was competition in areas B and F on site between the different parts of the development as per **Table 3.1** below.

Table 3.1 Areas on site suitable for the 3 elements of the proposed development

Area A	Area B	Area F
Tank Farm (1)	Tank Farm (1)	
	HGU (2)	HGU (2)
	Ash Storage (3)	Ash Storage (3)

In order to finally determine the locations for each of the elements, relevant environmental factors were identified for consideration. A lot of environmental factors are neutral due to their nature and in the context of choosing different areas on the same site. These are as follows:

- Population & Human Health
- Traffic
- Climate
- Biodiversity
- Cultural Heritage
- Land & Soils
- Water
- Major Accidents & Disasters.

Emissions to air has the potential to differ in impact for local sensitive receptors but in the case of the proposed development, there are no potential significant impacts and certainly no differences due to the location of the different elements on the same site. The remaining environmental factors have been set out in **Table 3.2** below for each of the elements of the proposed development in each of the areas.

Starting with the optimal location for the tank farm, it is clear that with no other part of the development competing for area A, and the fact that this area is closer to both the furnace and the existing tanker unloading area, area A was the preferred location for the tank farm. This choice is also supported by the fact that the height of the tanks (24m) is best screened at this location as identified in **Table 3.2** below.

This results in a competition between the HGU and the ash storage building for areas B & F. From an evaluation of the noise impact in **Table 3.2**, there is no real difference between the two, as both have operational traffic noise associated with them and excellent screening is offered in both areas by the site contours and berms.

It is clear from **Table 3.2** below that from a visual impact perspective, the positioning of the ash storage building in area B is the preferred option, due to the height and scale difference between the two buildings and the elevation difference between areas B & F.

It is also apparent from **Table 3.2** above that there is less material to be excavated and removed from site by locating the ash storage building in Area B. An additional benefit of choosing Area F for the HGU are that it is closer to the proposed injection point to the natural gas grid.

Table 3.2 Comparison of environmental effects for alternative locations on site

Environmental Factor	Area	Development	Advantages	Disadvantages
Material Assets	A	Tank Farm	Close to treatment (furnace) of the waste in the process and the existing tanker unloading area.	Working area is relatively confined
	B	Tank Farm	Large area of land available. Short cable runs from power distribution in main process plant.	Material excavation and removal required from existing berm. Long distance (more materials and infrastructure required) to treatment and unloading of the waste.
		HGU		Material excavation and removal required from existing berm. Long run of pipeline required to transport gas to connection point.
		Ash Storage		Material excavation and removal required from existing berm.
	F	HGU	Large area of land available Proximate to gas line connection point.	Material excavation and removal required from existing berm.
		Ash Storage	Large area of land available.	More material to be excavated and more surplus material to be sent off-site

Environmental Factor	Area	Development	Advantages	Disadvantages
Noise	A	Tank Farm	Farthest area from sensitive receptors (off-site) and screened by main process building but this activity is not noisy when in operation.	None
	B	Tank Farm	None	Closer to site boundary and sensitive receptors but operation is not noisy.
		HGU		
		Ash Storage	Closest available area to where ash is produced on site. Less noise from traffic movements on site.	Furthest available area on site from sensitive receptors (off-site).
	F	HGU	Noise Screening provided by adjacent berm	Closest area on site to noise sensitive receptors (off-site) but operation is not noisy. HGV traffic to and from the HGU close to noise sensitive receptors (off-site)
	F	Ash Storage	Noise Screening provided by adjacent berm.	On site traffic noise higher due to the distance required to transport the ash here. Closest area on site to noise sensitive receptors (off-site).
Landscape & Visual	A	Tank Farm	Adjacent to air-cooled condenser and also screened by main process building minimises visual impact.	None

Environmental Factor	Area	Development	Advantages	Disadvantages
Landscape & Visual	B	Tank Farm	Significant screening still offered due to the natural site contours and berms to the east.	Height of tanks means that they are more visible to nearest sensitive receptors (off-site) than Area A.
		HGU	Excellent screening due to the relatively low height (11m) and small scale (24m X 33m) of this building	None
		Ash Storage	Optimal position of the areas considered due to the screening offered and the scale (60m X 24m) and height (14m) of the building.	May be slightly visible to nearest sensitive receptor (off-site).
	F	HGU	Ample screening offered by adjacent berm (+51m OD) as ridge of building is at 48.5m OD	More visible from R152 approaching site from the North (but not at any sensitive receptor sites) than Area B.
		Ash Storage	Good screening of building but ridge height (51.5m OD) is slightly above the adjacent berm (51m OD)	Much more visible from R152 approaching from the North than the HGU building in this position due to its increased height and mass

3.4 Alternative Processes

3.4.1 Hazardous Waste Treatment (Waste to Energy)

No changes are required to the existing waste to energy treatment process itself to facilitate the treatment of an additional 15,000 tonnes per annum. A permanent storage facility is however required for aqueous waste prior to treatment and this is outlined in **Section 3.4.3** below. The current process is working successfully with regard to the treatment of hazardous and aqueous wastes and this is largely attributable to the advanced screening of the waste (profiled prior to acceptance, and further determined at collection and delivery) prior to treatment in the waste-to-energy plant.

As referred to above in relation to alternative sites, the facility and processes required are already in place at the Carranstown facility and are operating in a safe and efficient manner. Operation of the facility with an intake of 235,000 tonnes of hazardous and non-hazardous waste since 2014 has proven that there is available capacity and environmental controls in place at this facility.

Use of the existing process at Carranstown is considered the optimum method to efficiently treat up to 25,000 tonnes of hazardous waste annually. Therefore, it is considered that there is no reasonable alternative for hazardous waste treatment in this context given that the current process is working successfully.

3.4.2 Hazardous Waste Treatment (Pre-treatment of boiler ash and FGT residues)

The only changes required to the existing hazardous ash pre-treatment process to facilitate the acceptance of up to an additional 30,000 tonnes per annum is the addition of two storage silos within the main process building and a small unloading area. The current process is working successfully with regard to the treatment of boiler ash and flue gas cleaning residues generated on site.

There are other processes such as the “Carbon8” process which uses Accelerated Carbonation Technology to bind the residues into an aggregate that can be utilised in the construction industry. However, a market for the aggregate produced and also end of waste status from the Environmental Protection Agency would be required and neither are in place in Ireland currently. In addition, the technology and equipment is already installed and operational with adequate capacity to treat these residues. Therefore, there is no reasonable alternative for the recovery of these hazardous wastes on the island of Ireland.

3.4.3 Tank Farm – Aqueous Waste Storage

The accepted and proven way of storage of aqueous waste is using a tank farm designed to the required standards. No other alternative aqueous waste storage process was considered but alternative designs considered are outlined in **Section 3.5** below.

3.4.4 Alternative Processes relating to the Hydrogen Generation Unit

Alternative processes were explored for the utilisation of waste steam or the resultant waste electricity when power is not required by the grid. Several options were investigated over the past five to seven years including those listed below:

- Fly-wheel technology for energy storage
- Electric battery storage
- Users for steam off-take
- Use of the electricity for Hydrogen generation.

With the exception of Hydrogen generation, none of the other options provided a viable technical or economic case for further investigation. Fly wheel or battery storage are more efficient ways to store electricity for re-use but the energy they store cannot be released back onto the electricity grid when grid restrictions released as the size of the export line and rated MEC (Maximum Export Capacity) for the site cannot facilitate this.

The use of steam instead of producing electricity is environmentally more desirable and more energy efficient but requires constant heat demand within close proximity to the site from either an industrial source or high density of population. No such usage demand exists in this area.

Although the energy efficiency associated with an alkaline electrolysis unit to generate Hydrogen is lower than the storage solutions mentioned above, the case for this clean, non-carbon based fuel in the context of climate change policy and sustainability as outlined in **Section 9.5.3** of **Chapter 9** ***Climate*** is very compelling.

Alkaline electrolysis is 60% efficient at converting the electricity input from the waste to energy plant into a hydrogen fuel and is the only power to hydrogen gas process which is proven and has operating plants at the scale required ($10MW_e$) for this development. Hence there is no reasonable alternative process to alkaline electrolysis for hydrogen generation taking into account the characteristics of this project.

3.4.5 Bottom ash storage for off-site treatment

The only alternative process that could be considered on site to the storage of bottom ash prior to off-site treatment is the full treatment of bottom ash to recover remaining residual metals and to produce an aggregate material for onward sale to the construction industry. With only 40,000 tonnes per annum of bottom ash currently produced on site, the scale of investment would not be economical and in addition, the amount of space required would be significant and could not be accommodated on the existing site. Thus, no reasonable alternative exists.

3.5 Alternative Designs

3.5.1 Aqueous Waste Storage

Some alternatives were considered with regards to the type and size of tanks to be utilised for the unloading, storage, mixing of aqueous waste prior to transfer to the furnace for treatment. These alternatives would be considered standard in process engineering terms and would also be in accordance with the applicable BAT guidelines (see **Section 4.11 in Chapter 4 *Description of the Proposed Development*).** They are summarised in **Table 3.3** below. Some environmental factors were also considered during this process (such as material assets and visual impacts) as summarised in **Table 3.3:**

Based on the above considerations in the case of this application, avoiding quality issues with fabrication on site and the space required to fabricate wider diameter tanks (>5m), it was decided to utilise tall and thin tanks. Although there was a potential for increased visual impact, the location chosen on site ensured that this did not arise (refer to **Chapter 13 *Landscape & Visual***).

Table 3.3 Factors considered for alternative aqueous waste storage tank design

Design Consideration	Pro's	Con's
Single Skin in bund	Cheaper tank costs	Bund and additional civil works costs required Higher impact on material assets
Double skinned with no bund	No bund required Lower impact on material assets	Higher tank costs Bottom discharge from tank not possible
Tall and thin tanks	Can be fabricated off site to a higher quality standard and installed quickly on site.	Increased visual impact potential
Short and fat tanks	Lower visual impact potential	Fabrication on site requires a large area, process is slow and quality can be an issue
Small number of larger tanks	Lower investment cost per m^3 storage	Limited ability to segregate different wastes
Large number of smaller tanks	High degree of waste segregation possible	Higher investment cost per m^3
Conical bottom	Excellent solids extraction	Double Skin not possible
Flat bottom	Double skin possible	Solids build-up in tank

Conical bottoms were also chosen to ensure that any solids could be easily extracted from the tanks in the waste and pumped to the furnace. Choice of a conical bottom excluded the possibility for a double skinned tank, so single skinned tanks within a bund was required.

Two larger tanks (each 300m^3 capacity) were chosen instead of many smaller tanks as there is no significant need for the segregation of aqueous wastes due to the high water content.

3.5.2 Hydrogen Generation Unit

As the layout of the equipment is standard for such a plant and the visual impact is not significant (see **Section 13.8.2** of **Chapter 13** ***Landscape & Visual***), no alternative designs were considered. Colour finishes for the exterior cladding have been chosen to match the existing on site.

3.5.3 Bottom Ash Storage

Apart from the pitch of the roof (based on the orientation of ash trucks within the building when tipping) no other alternative designs were considered. Colour finishes for the exterior cladding were chosen to match the existing on site.

3.6 Do Nothing Scenario

3.6.1 Overview

In terms of this scenario, the overarching planning, waste and climate change law and policy framework applicable to the proposed development is comprehensively detailed in **Chapter 2** ***Policy and Planning Framework and Need for the Scheme*** of this EIAR and must be referred to in this regard. This chapter and **Section 3.3.2** above demonstrates in clear terms that the proposed development may be regarded as being in alignment with this overarching framework at both national and EU level and is capable of giving effect to the policy positions underlined therein.

Specifically, the treatment of additional hazardous waste, including hazardous aqueous waste as a component of the proposed development, will contribute to the State becoming more self-sufficient in the management of hazardous waste generated as prioritised in the National Hazardous Waste Management Plan. Furthermore, this is in alignment with such waste being treated in a more proximate manner and wider climate mitigation measures through the associated reduction in transport emissions through domestic treatment at an existing recovery facility in the State.

The proposed development is also consistent with the provisions of the Eastern Midland Regional Waste Management Plan which identifies an additional 50,000 tonnes of thermal recovery capacity for the treatment of hazardous wastes on a national basis.

From a planning perspective, the treatment of additional hazardous waste and residues and the development of a tank farm accords with the National Planning Framework, the National Development Plan and the Eastern Midland Region Regional Spatial and Economic Strategy.

This overarching planning framework provides for the development of necessary and appropriate hazardous waste management facilities to avoid the need for treatment elsewhere and underlines that continued investment in waste management infrastructure including private sector investment is critical to Ireland's environmental and economic wellbeing.

With regard to the development of a hydrogen generation unit for connection to the natural gas distribution network and for use in mobile hydrogen transport applications equally accords with the existing policy framework at national and regional level which underlines the pressing need to facilitate the development of enhanced electricity and gas supplies in order to support the State's transition to a low carbon economy.

This need is underlined in the National Planning Framework, the National Development Plan, the Regional Spatial and Economic Strategy for the Eastern Midlands Region and in the Meath County Development Plan.

In addition, the production of hydrogen to be utilised in mobile hydrogen transport applications also accords with the developing policy landscape on decarbonising the transport sector in the State and more broadly with emerging policy whereby this versatile technology can play a beneficial role in assisting with the State's broader decarbonisation and mitigation objectives.

The Climate Action 2019 and the regional Meath Climate Action Plan provide that there is a need for sustainable mobility at national and regional level. The Climate Action Plan specifically provides that decarbonisation options such as hydrogen vehicles are worthy of further investigation with the National Policy Framework on Alternative Fuels Infrastructure for Transport in Ireland: 2017 to 2030 similarly underlining the significant role that can be played by this innovative technology going forward and its ability to contribute to the decarbonisation of the transport sector as fossil fuel vehicles are significantly reduced in the medium to long term.

Given the significant policy alignment of the proposed development with all relevant plans, policies and objectives at national, regional and local level, it would not be reasonable in such circumstances to consider a do-nothing scenario as a reasonable alternative in the context of the proposed development.

3.6.2 Additional Hazardous Waste Treatment

In the absence of the proposed development, the Irish state will continue to be reliant on the export of aqueous waste and hazardous ash to mainland Europe. The main impacts of this would be the additional emissions associated with transport to Europe and the associated additional costs.

3.6.3 Hydrogen Generation Unit

In the absence of the development of the hydrogen generation unit, valuable renewable energy will continue to be destroyed/lost.

3.6.4 Bottom Ash Storage Building

In the absence of the development of the bottom ash storage building, the option to export bottom ash for recovery may not be economical (or possible at all) due to a reliance on third parties for the storage of the 3,000 tonnes in advance of an export shipment.