3 Alternatives

3.1 Introduction

This chapter addresses the alternatives considered in the development of the Ringaskiddy Resource Recovery Centre proposal. The site selection process is outlined in this chapter. In addition, the main alternative waste management options and technologies considered are described, and the environmental consequences of the alternatives, including best available techniques, are also considered.

3.2 Site Selection

3.2.1 1999 – 2000 Site Selection Study

Between December 1999 and December 2000, a search was conducted on behalf of Indaver for suitable locations in County Cork for a proposed waste-to-energy facility, which would include the thermal treatment of hazardous waste. The current site in Ringaskiddy was identified during that search and purchased by Indaver. This section outlines the 1999-2000 site search.

The 1999 - 2000 site selection process was described in section 2.6 of the *Indaver Ringaskiddy Waste Management Facility EIS (2001)*. Section 2.6 of that EIS is reproduced in **Appendix 3.1** and is summarised below.

In December 1999, Indaver appointed an engineering consultancy firm to carry out a site selection exercise to identify a site for a waste-to-energy facility which would include a hazardous waste incinerator. Indaver had specified that the search for a site should be confined to County Cork because the proposed *National Hazardous Waste Management Plan (2001),* which had been published by the EPA for public consultation at the time of the search, highlighted that industries located in Cork generated approximately 60% of the hazardous waste produced in Ireland and that most of this waste was produced by the pharmaceutical industry located in the Cork Harbour Region.

Between December 1999 and December 2000, a detailed search was conducted of the available lands that complied with the defined site selection criteria. Initially, a preliminary investigation of five areas around Cork Harbour was carried out, from which Ringaskiddy was identified as offering the best option for a possible site location.

Following this, it was decided to also assess five further possible areas in other parts of Cork County. All of these were subsequently discounted as less suitable than Ringaskiddy.

Four specific sites in Ringaskiddy were then short-listed for a more detailed investigation. Two of these were selected in early 2000 as preferred sites. One of these sites became available through a public auction in November 2000 and was purchased by Indaver. This is the site for the current proposed development. It is located at the eastern end of the Ringaskiddy Peninsula, surrounding the Hammond Lane Metal Co premises.

The 1999-2000 site selection process and criteria are summarised in the following table.

Table 3.1 1999 – 2000 Site Selection process and Criteria

Stage	Area	No. of Areas	Main Assessment Criteria
Phase 1	Cork Harbour	5 areas	Land Use/Zoning Land Ownership/Availability Availability of Utility Services
Phase 2	County Cork	5 areas	Land Use/Zoning Land Ownership/Availability Availability of Utility Services Road Access
Phase 3 Detailed Evaluation	Ringaskiddy	4 sites	Land Ownership/Availability Site area Land zoning Land description Land accessibility Site accessibility and road upgrade requirements Electrical supply and substation availability Natural gas supply Water supply Foul sewer Emergency response Site geology, hydrology, hydrogeology Historical soil contamination Distance to Ringaskiddy village from site boundary Distance to closest sensitive location from site boundary (WHO guidelines) Distance to nearest house from site boundary Estimate number of houses within 500ft (150m) Primary wind direction Potential visual impact Amenity areas Habitat areas

In 2004 Indaver obtained planning permission for a waste-to-energy facility on the site. The facility included a line for the incineration of industrial and hazardous waste. The EPA granted Indaver a licence for the incineration of hazardous, non-hazardous and municipal waste on the site in 2005.

3.2.2 Indaver's Economic and Environmental Evaluation of the Site's Suitability for the Ringaskiddy Resource Recovery Centre in 2015

In 2014 Indaver considered where to locate a proposed resource recovery facility. Indaver decided to locate the proposed development at the site it owned in Ringaskiddy, County Cork. Indaver's 2014 - 2015 economic and environmental considerations in relation to the site are outlined below.

Indaver's choice of Ringaskiddy, County Cork, as the best site for the proposed resource recovery centre was influenced, in particular, by previous site selection studies which established the Ringaskiddy site as being:

- In close proximity to a large centre of hazardous waste generation
- Suitable in terms of accessibility, availability of services (electricity, natural gas supply, water and foul sewer), emergency response
- Suitable in terms of geology, hydrology and hydrogeology
- Suitable in terms of proximity to housing and sensitive locations
- Suitable in terms of visual impact, impact on amenity areas and impact on habitat areas

Also relevant for the choice of site was the (November 2014 draft) Southern Region Waste Management Plan, the National Hazardous Waste Management Plan 2014 - 2020 and the already existing developments in Ringaskiddy itself. These factors pointed towards Ringaskiddy as a suitable location for a municipal waste treatment facility, particularly given the industrial zoning, proximity to the largest population centre outside of Dublin and the considerable distance from other outlets for residual municipal waste recovery (in Dublin[1], Westmeath[2] and Meath[3]). Finally, as outlined in **Chapter 2 *Planning and Policy Framework and Need*** of this EIS, Ringaskiddy's suitability for strategic large scale waste treatment facilities including waste-to-energy recovery facilities is underscored by its location in an industrial area that is also a Strategic Employment Area.

The Southern Region Waste Management Plan 2015 – 2021 ("SRWMP") was made in May 2015. The Cork County Development Plan was amended in March 2015. Indaver confirmed its choice of the Ringaskiddy site, following the making of the waste plan and the amendment of the Cork County Development Plan.

The following sections detail the economic and environmental considerations in choosing the site in particular, while the need for the scheme itself has already been fully addressed in **Chapter 2, *Policy and Planning Framework and Need for the Scheme*** of this EIS.

3.2.3 Focus on the Southern Region

In the Eastern and Midlands region, the Indaver facility at Meath and the facility under construction in Poolbeg will have the combined capacity to recover over 835,000 tonnes residual municipal solid waste (MSW). Lagan Cement in Kinnegad, Co Westmeath, and Irish Cement in Co Meath, can also accept pre-treated commercial waste. Section 16.4.5 of the SRWMP (Page 187) notes that

> *"the spatial distribution of facilities nationally is potentially unbalanced, with all active and pending facilities located in one region. Despite the strong road network linking regional urban centres to the capital, there is a need to consider the spatial distribution of thermal recovery capacity in the State when authorising future facilities"*

[1] Poolbeg waste-to-energy facility in Dublin, Co Dublin (under construction)

[2] Lagan Cement in Kinnegad, Co Westmeath which can accept residual pre-treated commercial waste

[3] Meath waste-to-energy facility in Carranstown, Duleek, Co Meath

See **Table 3.2** below for possible locations outside of the Eastern and Midlands Leinster Region.

As the Eastern and Midlands region is catered for, this leaves two other waste regions: Connacht/Ulster, and the Southern region. In 2011, the respective populations of these two regions were 837,350 and 1,541,359[4], which suggests the need for the treatment of MSW is considerably larger in the Southern region.

In respect of the Southern region, Cork City and County is the most populous area by a significant factor. According to the CSO, the population of the City and County was just over half a million in 2011, with Limerick City and County having the next largest population of just 191,809 by comparison[5].

Table 3.2 shows that Cork City and County has the highest population outside Dublin and is furthest away from infrastructural interference.

Table 3.2 Population of Counties Cork, Limerick and Galway

Location	Population in city & county (2011)	Distance from Dublin city to named city
Cork	519,032	267km
Limerick	191,809	202km
Galway	250,654	209km

Establishing levels of industry by county is more challenging. However, there were 110,809 employees in Cork City and County in 2012, while by comparison Limerick City and County had only 34,981[6], which suggests a greater level of industry in Cork City and County, and by extension, a greater production of industrial waste. Ringaskiddy is strategically located in close proximity to a number of urban centres, industrial waste producers and a Port of National Significance (Tier 1).[7]

The SRWMP itself identifies the market for waste treatment of MSW waste, noting that “though there are authorised waste treatment facilities in the region, they are not adequate in terms of either the waste streams they treat, or the amount of waste they treat.” (179). The plan notes that the supply of waste treatments is inadequate for biowaste and MSW in particular (179). The proposed Indaver facility at Ringaskiddy would create balance in terms of the distribution of facilities, and meet the need for the treatment of MSW in the Southern region.

The proximity principle underpins Indaver’s choice of a site in Ringaskiddy, as it is located near sources of hazardous and non-hazardous municipal and industrial waste. As noted in **Table 3.2** above, within the Southern region, the largest population centre is Cork City and County, which means this is the area where the largest concentration of MSW is produced. Within Cork City and County, the greatest concentration of the population, and the focus for strategic planning, is the Metropolitan Cork Area. According to the Cork County Development Plan 2014 (Table 2.1), the population of the Metropolitan Cork area, including Cork

[4] http://www.cso.ie/multiquicktables/quickTables.aspx?id=cna23

[5] http://www.cso.ie/multiquicktables/quickTables.aspx?id=cna23

[6] http://www.cso.ie/multiquicktables/quickTables.aspx?id=bra08_4

[7] Department of Transport, Tourism and Sport, *National Ports Policy*, 2013.

City, was 289,739 people at 2011, or 56% of the total population of the City and County. In addition to this, Cork is a hub for the pharmaceutical industry. Little Island and Ringaskiddy itself are home to a cluster of multinational pharmaceutical companies, the producers of the hazardous and non-hazardous industrial waste that the proposed waste-to-energy facility would treat. There is also potential for commercial synergies with other, non-pharmaceutical local businesses.

The proposed facility will treat both hazardous and non-hazardous waste, a combination current policy recognises as reasonable. The National Hazardous Waste Management Plan recommends that Ireland strives for greater self-sufficiency in hazardous waste management, but emphasises that it must be strategically advisable, and technically and economically feasible to do so. The co-treatment of both hazardous and non-hazardous waste makes the proposed development feasible for Indaver.

3.2.4 Focus on energy production - proposed

The proposed facility in Ringaskiddy would both treat waste and produce energy. This being the case, Indaver needs to consider the demand for the energy created as well as the supply of hazardous and non-hazardous municipal and industrial waste. In view of this, Indaver commissioned a report to assess whether the site is suitable for supplying electricity to the grid. ESB Networks has conducted a study, on behalf of Indaver, investigating the feasibility of creating a connection into the national grid at a connection point in the Ringaskiddy area (Reference: D/47/6043/1064). **Refer to Appendix 3.2**. This was provided for information purposes only and did not constitute any form of grid connection offer. The ability to supply to the grid depends on three factors:

- The presence of a connection point.
- The ability of the grid to accommodate the additional capacity the waste-to-energy facility will generate.
- Receiving and executing a grid connection offer in a timely fashion.

The ESB Networks feasibility study found that the suitable connection point into the national grid was at the nearest 38kV substation (Loughbeg substation) which services the Hammond Lane Metal Recycling Company Ltd. The Loughbeg station is located adjacent to the Indaver site. The grid has the ability to handle the additional capacity, which is further evidence of the synergies of the proposed location.

3.2.5 Focus on energy production - potential

A benefit of locating the waste-to-energy facility in the Ringaskiddy is that there is a greater potential to contribute towards the Energy Efficiency Directive objectives and EU efficiency targets than in other locations. The Energy Efficiency Directive (2012/27/EU) promotes the use of cogeneration, district heating and cooling, and waste industrial heat recovery. There are a number of significant industrial facilities, which have large and constant process heat requirements, located within 3 km of the site. This gives rise to the potential for the waste-to-energy facility to provide steam or hot water to those heat users.

There are a number of regulatory uncertainties and funding issues to resolve prior to the development of a heat distribution network. Therefore, district heating is not part of the current proposal. It is envisaged that the waste-to-energy facility will be initially developed with the same design as the Meath waste-to-energy facility e.g. with focus on electricity production. However, full flexibility will be built into the design to facilitate its operation for both heat and electricity production if it became possible to progress with the heating supply network.

3.2.6 Site History

Indaver has considered the planning history of the site to establish whether the site's suitability had changed. The planning history of this particular site suggests that the site is suitable for the treatment of hazardous and non-hazardous municipal and industrial waste, see **Table 3.3** for a brief summary of the planning history.

Table 3.3 Summary of planning and licencing history on the site

2004 planning	An Bord Pleanála granted permission for a waste-to-energy facility for hazardous and non-hazardous industrial and commercial waste, a waste transfer station and a community recycling park for household recyclable waste.
2005 licensing	The Environmental Protection Agency granted an operating licence for a waste-to-energy facility for hazardous and non-hazardous industrial and commercial waste, a waste transfer station and a community recycling park for household recyclable waste
2008 planning	An Bord Pleanála considered that the provision of an incinerator to treat hazardous and industrial waste was in accordance with national policy and represented an element of national strategic infrastructure for which Indaver's site may be generally acceptable, subject to the submission of additional information for further assessment by the Bord. However, Indaver's revised proposals were designed to facilitate the future provision of municipal waste treatment (as it would not have been economically viable for Indaver to omit this possibility). The Board was not satisfied that the provision of incineration capacity to deal with residual municipal waste, in addition to hazardous waste, at the site was appropriate at that time having regard to then waste management strategy of Cork County Council (since changed). The Board accordingly decided to refuse permission for the entire development including the hazardous/industrial element.

During the original site selection process in 1999/2000, Indaver focussed on identifying a site for hazardous and non-hazardous waste treatment. Indaver has significant experience in operating waste-to-energy facilities for hazardous and non-hazardous municipal and industrial waste, and considered that the technical requirements for a site for a waste-to-energy facility for hazardous waste would be at least as onerous as the technical requirements for a site for a waste-to-energy facility for municipal solid waste (MSW). Therefore the site was assessed with respect to its suitability for a waste-to-energy facility for hazardous waste.

In the 2001 EIS, Indaver detailed plans for a two stage development of waste-to-energy on the site. Phase One was to have been a fluidised bed furnace line for hazardous and industrial waste. Phase Two was proposed to have been a moving grate furnace line for MSW. In 2004, An Bord Pleanála granted Indaver planning permission for both phases of the then proposed waste-to-energy facility to treat hazardous and non-hazardous industrial waste.

In response to Indaver's 2008 planning application, An Bord Pleanála informed Indaver in writing that the proposed location could be suitable for a waste-to-energy facility to treat industrial and hazardous waste subject to the submission of revised drawings and particulars, and a revised EIS. An Bord Pleanála's grounds for refusing permission for the 2008 application pertained to the particulars of the proposed development, and not to any perceived unsuitability of the site location for a waste-to energy-facility.

Specifically, one of the grounds for refusal of the 2008 application for permission was that the facility was not compatible with the then Waste Management Strategy for the region or the Waste Management Plan for County Cork, 2004. However, many changes have taken place since 2009 including the consolidation of waste regions from ten to three and the replacement of regional plans. The SRWMP (replacing *inter alia* the previous Cork City and County waste plan) calls for the development of 300,000 tonnes per annum waste-to-energy capacity on a national level. The Ringaskiddy Resource Recovery Centre is compatible with this objective, as set out in **Chapter 2, *Policy and Planning Framework and Need for the Scheme*** of this EIS.

It is also worth noting that the EPA granted Indaver a waste licence for the operation of a waste-to-energy facility for MSW, hazardous and industrial waste on the site. As the EPA is legally precluded from granting a licence for an activity which would cause significant pollution, the granting of a licence is an implicit acceptance by the EPA that the proposed facility is appropriate for the site in question.

3.2.7 Site Suitability Assessment 2015

Indaver was aware that in the time since An Bord Pleanála's 2004 and 2010 consideration of the suitability of the site, changes may have occurred on the site or in its general vicinity. Further, the generally accepted technical requirements for a site for such a facility may also have changed. Consequently, Indaver commissioned Arup to undertake a technical review of the site and surroundings. Coakley O'Neill were commissioned to undertake an evaluation of the Ringaskiddy site with respect to current planning policies.

3.2.8 Implications for the Site of Changes in the Ringaskiddy Area Since 2000

3.2.8.1 Changes in the Ringaskiddy Area Since 2000

Since 2000, when the Indaver site was initially selected, a number of developments have taken place in Ringaskiddy and several more are planned. The principal recent and proposed developments are described below and the implications of these developments, for the suitability of the Indaver site for the proposed development, are considered.

3.2.8.2 Hammond Lane Metal Company Ltd.

Hammond Lane Metal Company Ltd, which is located adjacent to the Indaver site, was in operation in 2000. In 2013, Hammond Lane received planning

permission to demolish its existing administrative building and to reconstruct and extend its facilities. Construction of this project has been completed. Currently, Hammond Lane operates under a waste permit. However Hammond Lane has applied to the EPA for an industrial emissions licence for “activity class 11.4(b)(iv) recovery, or mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one or more of the following activities, (other than activities to which the Urban Waste Water Treatment Regulations 2001 (S.I. No. 254 of 2001) apply): treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components.” (EPA register number P0997-01)

3.2.8.3 3MW Wind Turbines

In 2014 three industrial sites erected 3MW wind turbines in the general area. One wind turbine is 1.5km to the west of the Indaver site, another is located directly to the south of the site, and another is further to the site in Curabinny. The turbines are now in operation. The Novartis plant, circa 2km to the west-southwest of the site has planning permission for a turbine, which has not been erected yet

3.2.8.4 Fleming Developments (In Receivership)

Between 2000 and 2008, Fleming Developments built a facility at Loughbeg to manufacture modular building pods. In 2012, Fleming Developments (In Receivership) received a grant of planning permission for continuation of use of demountable residential accommodation units at Ring Port Business Park, Loughbeg.

3.2.8.5 IMERC

IMERC is a marine research and innovation campus being developed by University College Cork, Cork Institute of Technology and the Irish Naval Service. The National Maritime College of Ireland and the Beaufort Research Laboratory are the first two components of IMERC to be developed and further elements are planned. The further elements will include facilities for marine and energy research and commercial and incubator units. No residential accommodation is planned. The site for the additional facilities is to the north of L2545 road, between the National Maritime College of Ireland and the access road to Haulbowline.

3.2.8.6 The National Maritime College of Ireland

The National Maritime College of Ireland was built since 2000 on land on the northern side of the L2545 road, to the north of the Indaver site. The proposals for the College had been published prior to Indaver obtaining planning permission in 2004. The National Maritime College of Ireland is a third level college and provides both merchant marine and naval training and education. It does not have residential accommodation. In 2011, the Cork Institute of Technology received planning permission for the construction of a synthetic all-weather playing pitch at the National Maritime College of Ireland.

3.2.8.7 Beaufort Research Laboratory

The Beaufort Research Laboratory phase one has been built which is to the east of the National Maritime College of Ireland and north of the L2545 road.

3.2.8.8 EirGrid

Since 2000 EirGrid installed high voltage cables in the L2545 road, which forms the northern boundary of the Indaver site. The cables extend under the sea across the Harbour to Corkbeg, Whitegate.

3.2.8.9 The Island Crematorium

Since 2000 the Island Crematorium was developed in a former naval magazine on Rocky Island, which is located between Ringaskiddy and Haulbowline Island.

3.2.8.10 Ispat Steelworks Site, Haulbowline Island

The Ispat steel manufacturing facility, located adjacent to the naval base on Haulbowline Island, ceased operation in 2001 and the buildings on the site have been demolished. The site is currently being investigated and assessed to determine potential contamination remediation requirements. Cork County Council has planning permission and a waste licence to undertake remediation works and redevelop as a public park the East Tip, which was associated with the steelworks on Haulbowline Island. An overall development master plan for the entire Island is currently being developed.

3.2.8.11 Irish Naval Service base, Haulbowline Island

There has been a naval base at Haulbowline for several hundred years. The base is the headquarters of the Irish Naval Service. There are accommodation for personnel and recreational amenities including a playing pitch and a yacht marina. Since 2000 there have been various developments and facility upgrades by the Naval Service. Newer, bigger ships are now based there.

3.2.8.12 Spike Island

The prison on Spike Island, to the east of Ringaskiddy has been closed since 2004. In 2010, the Department of Justice and Law Reform handed control of the island to Cork County Council, and the island has become a visitor attraction, with boat tours operating from Cobh. Cork County Council published a master plan for Spike Island in 2012. The master plan proposes that the Island is developed as a tourist and amenity destination with improved access, ferry links to other locations in the harbour, redevelopment of the existing buildings for compatible new uses, construction of walking and cycling paths, an adventure centre, a retreat centre, a camp site and extensive landscaping. Limited tourist accommodation has been proposed.

3.2.8.13 Port of Cork

The Port of Cork has had a significant facility in Ringaskiddy since before 2000. The master plan for the Port of Cork identified the existing deepwater facility at Ringaskiddy for substantial expansion in the future to meet growth in container handling. In 2015, the Port of Cork obtained planning permission from An Bord Pleanála to extend the Ringaskiddy deepwater facility. The project includes container berths and a multi-purpose berth at Ringaskiddy East, a deepwater berth extension at Ringaskiddy West, road improvements and an amenity area.

There are a number of port-related facilities, such as grain stores and hard-standings for vehicle storage, in and around the Port of Cork's lands in Ringaskiddy. These have been extended over the years since 2000.

3.2.8.14 M28 Cork to Ringaskiddy Motorway Scheme

Cork County Council in association with the Transport Infrastructure Ireland (TII) (formerly National Roads Authority (NRA)) plans to construct a new N28 dual carriageway road from the Bloomfield Interchange, near Douglas, to Ringaskiddy. This road, which is currently being designed, will serve the future traffic needs of the area while removing traffic from Shanbally and Ringaskiddy villages. The timeframe for construction of this road remains to be confirmed. It is expected that the application for a motorway order will be made to An Bord Pleanála in 2016.

3.2.8.15 Municipal Sewage Treatment Plan at Shanbally

Irish Water proposes started construction in 2015 of a new municipal sewage treatment facility at Shanbally, Ringaskiddy, for the Cork Lower Harbour Main Drainage Scheme. The facility will treat the sewage from the Lower Harbour towns and villages including Carrigaline, Ringaskiddy and Shanbally.

3.2.8.16 Residential Developments

Several new small scale and single unit residential developments have been constructed adjacent to Ringaskiddy village since 2000 and planning applications have been submitted for several others. These include apartments for student accommodation, to be located on the western side of the village.

3.2.8.17 Amenity Developments

The Ringaskiddy and District Residents Association received planning permission in 2014 for the construction of a community children's playground on a site adjacent to the N28 in Ringaskiddy Village. This playground has been constructed. The Port of Cork planning permission, referred to above, includes a pier, slipway and amenity area at Paddy's Point.

3.2.8.18 Ferry and Cruise Ship Business

The ferry port at Ringaskiddy existed prior to 2000 and there is a weekly ferry to Brittany. However, there has been a big increase in the numbers of cruise liners

visiting Cork Harbour since 2000. The ships come mainly in the months from April to October and usually dock at Cobh, with Ringaskiddy being used if there is a second ship in port.

3.2.8.19 Pharmaceutical Developments

In addition to the manufacturing facilities mentioned above, several of the other large pharmaceutical facilities, which are located in the Ringaskiddy area, have expanded or made alterations to their facilities since 2008. The Pfizer pharmaceutical manufacturing facility at Loughbeg was purchased by Hovione in 2008. DePuy Synthes purchased the former Pfizer tableting facility at Loughbeg in 2013. In 2011 BioMarin purchased the Pfizer Biologics facility, which is located to the west of the main Pfizer Pharmaceuticals manufacturing facility in Ringaskiddy.

3.2.8.20 Implications of Recent Proposed Developments for the Suitability of Indaver's Site

It is considered that the ongoing development of IMERC has changed the setting of L2545 road, at the Indaver site, from an undeveloped rural road to a more built-up, campus setting. The future tourism and amenity roles for Spike and Haulbowline Islands and the increased cruise liner business in Cobh have been taken into account in the external treatment of the buildings on site and in the visual and landscape impact assessment. However, these developments do not negatively impact the suitability of the Indaver site for the proposed development.

The expansion of the Hammond Lane activity allows increased synergies with the proposed Indaver facility.

If the M28 road upgrade receives permission and proceeds to construction, the road access to the Indaver site will be improved. However, the M28 upgrade is not necessary to Indaver's proposals.

The Indaver proposals includes the treatment of sewage on site. When the proposed Cork Lower Harbour Main Drainage Scheme becomes operational at Shanbally, sewage from the Indaver facility could be directed to it. However, the Cork Lower Harbour Main Drainage Scheme is not necessary to Indaver's proposals.

In addition to directing sewage to the main drainage scheme, sludge from municipal and industrial wastewater treatment facilities may require treatment. If alternative specialised infrastructure were not developed, the Ringaskiddy Resource Recovery Centre would be suited to accepting these streams.

3.2.8.21 Proposed Ringaskiddy Resource Recovery Centre

The current Indaver proposal is to construct a resource recovery centre consisting of a waste-to-energy facility, for the treatment of waste and for the recovery of energy. The waste-to-energy facility will have a capacity of 240,000 tonnes per annum and will accept industrial, commercial and municipal, hazardous and non-hazardous residual waste. The facility will produce approximately 21 megawatts of electricity.

The waste-to-energy facility proposed by Indaver in 2000 had two furnace lines. The current proposal has one furnace line to treat a similar quantity of waste. In the current proposal, a smaller volume of liquid hazardous waste will be treated. A community recycling facility and waste transfer station were proposed in 2000 but are not part of the current proposal. The currently proposed layout of the waste-to energy facility is different from that proposed in 2000.

The differences between the 2000 proposals and current proposals do not render the site unsuitable.

3.2.9 2015 Site Evaluation

3.2.9.1 Southern Region Waste Management Plan 2015 – 2021 Environmental Protection Criteria for Siting of Waste Facilities

In 2015, an evaluation was undertaken of the ongoing suitability of the Indaver site for the proposed development.

In line with national and regional waste policy, and national, regional and local planning policy, the key issues to address in terms of the suitability of the identified site in Ringaskiddy are the compatibility of the proposed development with relevant planning, environmental, nature and landscape protection policies as they apply around Cork Harbour.

In this regard, section 16.5 of the Southern Region Waste Management Plan 2015-2021 sets out overarching environmental protection criteria for waste-related activities requiring consent. In accordance with policy objective G3 of the Southern Region Waste Management Plan, these criteria seek to ensure there is a consistent approach to the protection of the environment and communities through the authorisation of locations for the treatment of wastes.

It is noted that Local Authorities in the region intend to develop and review facility-specific guidelines over the course of the Waste Management Plan. Policy Action G.3.1 of Section 19.8 of the SRWMP refers.

However, Cork County Council, in adopting the Cork County Development Plan 2014, which has been subject to a Strategic Environmental Assessment, has already determined that, by reference of zoning objective ZU 3-7, the most appropriate locations for strategic large scale waste treatment facilities, including waste-to-energy recovery facilities, are in ‘Industrial Areas’ designated as ‘Strategic Employment Areas’. The site of the proposed development at Ringaskiddy is within an Industrial Area designated as a Strategic Employment Area.

The SRWMP states that the environmental criteria are consistent with the objectives of the Waste Framework Directive 2008/98/EC, namely:

- “The protection of public health and the environment;
- The establishment of an adequate network of appropriate installations;
- Disposal installations (taking into account the Best Available Technology (BAT) without involving excessive costs); and

- An adequate transport network so that waste can be disposed in one of the nearest installations."

The criteria, set out in Section 16.5, are divided into those which relate to the general environment and those which relate to European sites. The SRWMP states that, in general, future waste activities requiring consent will need to consider these criteria.

The environmental protection criteria listed in Section 16.5 of the SRWMP are listed below and the compliance of the proposed development with each criterion is evaluated.

3.2.9.2 Areas Protected For Landscape, Visual Amenity, Geology, Heritage And Cultural Value

In relation to the general environment, the following criteria are to be considered:

> *"Avoid, as far as possible, siting waste infrastructure or related infrastructure in areas protected for landscape and visual amenity, geology, heritage and or cultural value. Where it is unavoidable, an impact assessment should be carried out by a suitably qualified practitioner and appropriate mitigation and/or alternatives must be provided."*

Objective ZU 3-7 of the Cork County Development Plan 2014 [CDP] specifies that the provision of large scale waste treatment facilities including waste-to-energy recovery will be considered in industrial areas which are designated as Strategic Employment Areas. The Strategic Employment Areas in County Cork are Carrigtwohill, Kilbarry, Little Island, Whitegate and Ringaskiddy. All of these areas are also designated in the CDP as High Value Landscapes. Refer to Section 13.6 of the Plan.

As a consequence, in complying with the land use objectives of the CDP, it is unavoidable that the proposed Indaver facility is also located in a High Value Landscape area. It should be noted that the CDP recognises that landscapes are dynamic and continuously evolving. The objectives of the CDP, with respect to High Value Landscapes, do not attempt to prevent new uses or changes but to manage the change. Rather than prohibiting large scale developments in such landscapes, the CDP specifies that such developments within High Value Landscapes need to be undertaken with considerable care.

The visual and landscape impact of the proposed Indaver development has been assessed by Wilson Architects and Brady Shipman Martin, Landscape Architects, and appropriate mitigation has been incorporated into the overall design and site landscaping to reduce the visual impact on the receiving environment. See **Chapter 11 *Landscape and Visual Assessment*** of this EIS for more detail.

The landscape within which the proposed development is located has changed significantly in recent years. The changes include the expansion of the Hammond Lane Metal Recycling facility, which was permitted by Cork County Council, under register reference 12/5863, and four wind turbines of 100m hub height (150.5m tip height), which An Bord Pleanála already determined would not interfere with the character of the landscape of Cork Harbour or with views or prospects of special amenity value (cases PL04 .240328, PL04 .240330, PL04 .240332 and PL04 .240329 refer). In making its decisions to grant permission in respect of these applications, the Board had regard to the existing character of Cork Harbour which reflects the multiplicity of industrial, port, commercial, leisure

and other uses already established at this location. The Board's recent grant of permission for a substantial container terminal at the Port of Cork in Ringaskiddy under register reference PL04 .PA0035 will also contribute to the dynamic landscape within which the proposed development is to be considered. In this regard, the proposed development is located in an area that already accommodates large scale industrial development and, having regard to its Strategic Employment Area designation, is zoned to accommodate future expansion of this industrial base.

The R610 road from Passage West to Shanbally, the N28 road from Shanbally village to Ringaskiddy village, and the L2545 road, from Ringaskiddy village to the car park which is adjacent to the north-eastern corner of the proposed Indaver development, are designated in the CDP as scenic route S54. The views from this route, which are identified for protection, are primarily the views of the Harbour. Refer to Section 13.7 of Volume 1 and Chapter 5 of Volume 2 of the CDP. The CDP makes clear that the designation as a scenic route is not intended to be a prohibition of development along the route but that development should not hinder or obstruct the specific views and prospects from the route, which are identified in the plan, and that developments should be designed and located to minimise their impact. As demonstrated in **Chapter 11**, ***Landscape and Visual*** of this EIS the proposed development will not hinder or obstruct the views of the harbour from the N28 or L2545. In addition, the layout of the proposed development, with its campus style approach and the additional landscaping, will assist in absorbing the development into the existing landscape.

There are no protected geological heritage or cultural heritage features on the proposed development site. The nearest geological heritage feature is Golden Rock, on the foreshore approximately 200m southeast of the site. The nearest cultural heritage feature is the Martello Tower, which is located approximately 70m south of the site boundary, to the southwest of the areas of the site which it is proposed to develop. Further to advice from Lane Purcell Archaeology, and Brady Shipman Martin, Landscape Architects, the proposed development has been designed to ensure that the critical views from the Martello Tower to Fort Mitchell on Spike Island have been maintained. The provision of an amenity walkway towards the Martello Tower (and viewing platform looking eastwards towards Spike Island) as part of the development will assist in ensuring the future enjoyment of this historical amenity.

3.2.9.3 Natural Heritage Areas And Other Sites With National Designations

> *"Avoid siting waste infrastructure or related infrastructure in proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna and Annex I habitats occurring outside designated sites;"*

The site is not designated as a natural heritage area, a proposed natural heritage area, a Statutory Nature Reserve or a Refuge for Fauna. There are no Annex 1 habitats on the site. The nearest such designated site is the Lough Beg proposed natural heritage area, the nearest point of which is located approximately 300m to the south of the site. The potential impact of the project on designated sites, including the proposed natural heritage area, is assessed in **Chapter 13, *Soils, Geology, Hydrogeology, Hydrology & Coastal Recession*** of this EIS and in

the NIS, which accompanies this application. These have concluded that there will not be a significant effect on the integrity of the designated sites.

3.2.9.4 Invasive Alien Species

> *"To prevent the spread of Invasive Alien Species (IAS) where waste material is transported from one location to another, an IAS survey of source and receptor sites will be conducted by a suitably qualified person. If IAS are found, preventative measures will be implemented to prevent the onward spread of the plant/animal material including: employment of good site hygiene practices in the movement of materials into, out of and around the site; ensuring that imported soil is free of the seeds and rhizomes of key invasive species; adherence to any national codes of practice relating to prevention of the spread of IAS (including both Ireland and Northern Ireland Codes of Practice);"*

The flora and fauna on site of the proposed development have been surveyed. Japanese knotweed, an invasive alien species, has been identified in the adjacent field, to the west and in north-western corner of the western part of the site. National codes of practice relating to the prevention of the spread of invasive alien species will be complied with in relation to the treatment of the Japanese knotweed identified on the site before and during the construction of the project.

3.2.9.5 Linear and Continuous Habitats

> *"In order to protect habitats which, by virtue of their linear and continuous structure (e.g. rivers and their banks) or their contribution as stepping stones (e.g. ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species, these features will be protected as far as is possible from loss or disruption through good site layout and design;"*

There are no rivers, ponds or small woods on the site of the proposed development and the site is not on a river bank. The site does not form part of a feature which is essential for the migration, dispersal and genetic exchange of wild species.

3.2.9.6 River Habitats And Water Quality

> *"To protect river habitats and water quality, ensure that no development, including clearance and storage of materials, takes place within a minimum distance of 15m measured from each bank of any river, stream or watercourse;"*

There are no rivers, streams or watercourses on the site of the proposed development.

3.2.9.7 Sustainable Drainage System

> *"Ensure that a Sustainable Drainage System (SuDS) is applied to any development and that site-specific solutions to surface water drainage systems are developed, which meet the requirements of the Water Framework Directive and associated River Basin Management Plans;"*

The site of the proposed development is suitable for a SuDS approach to surface water drainage and a site-specific SuDS solution will be applied, subject to the requirements of industrial emissions licensing. The surface water drainage will be designed to meet the requirements of the Water Framework Directive and the River Basin Management Plan for the Southwestern River Basin District.

3.2.9.8 Flood Risk Areas

"Avoid development of waste management infrastructure in flood risk areas. Reference should be made to the Planning System and Flood Risk Management for Planning Authorities (DoEHG/OPW 2009) and National Flood Hazard Mapping (OPW) and the relevant Flood Risk Management Plan (FRMP);"

A flood risk assessment of the site of the proposed development has been undertaken. Refer to **Appendix 13.6** of this EIS. It is worth noting that the site is classified as "Flood Zone C" according to the OPW Planning Guidelines (2009)[8]

The proposed development site is not located in Flood Zones A or B by reference to the Carrigaline Electoral Area Local Area Plan 2011, which contains the OPW's National Flood Hazard Mapping as it pertains to the Carrigaline area, including Ringaskiddy.

The risk to the proposed development of fluvial flooding, that is flooding caused by a river, is extremely low, as there are no rivers nearby.

A very small part of the site of the proposed development is at risk from pluvial flooding that is flooding caused by rainfall-generated overland flow. This area is to the west of the Hammond Lane entrance, and located between the Hammond Lane premises and the L2545 road. Parts of this area of the site are below the level of the adjacent road. The surface water drainage in the L2545 road is inadequate and the road floods following prolonged heavy rain. Rainwater collected on the road is discharged into the adjacent low-lying part of the site by forming drains within the site boundary. This low-lying area is below the 1 in 200 year high tide level and is at risk of tidal flooding. However, it should be noted that the area is approximately 300m from the shoreline, at the nearest point, and the intervening ground is above the 1 in 200 year high tide level. In the part of the site to the east of Hammond Lane only a very narrow strip adjacent to the road boundary is below the 1 in 200 year high tide level and the intervening ground between this area and the shoreline is above the 1 in 200 year high tide level. Most of the site is well above the 1 in 200 year high tide level and the level of the L2545 road.

In order to eliminate flood risk, as part of this development proposal, the levels of the Indaver site will be increased such that all areas of the site will be above the 1 in 200 year high tide level. In addition the surface water drainage of the L2545 adjacent to the Indaver site will be upgraded to ensure that flooding will not occur on the road. This upgrade will address the issue of flooding for road-users relating to all sites in the locality, including Spike Island, Haulbowline, and the Maritime College.

3.2.9.9 Riparian Buffer Zones

"Ensure that riparian buffer zones (minimum of 15m) are created between all watercourses and any development to mitigate against flood risk. The extent of these buffer zones shall be determined in consultation with a qualified ecologist and following a Flood Risk

[8] Flood Zones are geographical areas within which the likelihood of flooding is in a particular range. There are three types of flood zones defined in the OPW Planning Guidelines (2009): A, B & C. The Indaver site is located in *Flood Zone C* which is defined as "Probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding)"

Assessment. Any hard landscaping proposals shall be located outside of these buffer zones;"

There is minimal risk of fluvial flooding of the site as there are no rivers nearby. Accordingly, there is no requirement to create any riparian buffer zones in the vicinity of the proposed development.

3.2.9.10 Geologically Unsuitable Areas

"Avoid geologically unsuitable areas including karst where practicable, and areas susceptible to subsidence or landslides. Due consideration should be given to the primary water source of the area and the degree of surface water/groundwater interaction;"

The geological and hydrogeological conditions of the site of the proposed development are suitable for the type of development proposed. The site is not a karst area and is not susceptible to subsidence. A review of the landslide information on the GSI Irish Landslides Database indicates that the landslide potential in the vicinity of the site is primarily confined to the shore line. Refer to **Chapter 13, *Soils, Geology, Hydrogeology, Hydrology & Coastal Recession*** of this EIS. The proposed placement of sacrificial material on the beach will mitigate this potential hazard. In the past, the overburden on a section of the eastern part of the site was removed for reclamation works to the north of the site. The resultant slope is steep and is indicated to have some landslide potential in the GSI landslide data base. The retaining structures, which will form part of the proposed development, will ensure that there is no potential for landslides in the future. The primary water source in Ringaskiddy is an Irish Water piped supply and not groundwater. The degree of surface water/groundwater interaction has no implication for the development of the site.

3.2.9.11 Consultation With Airport Authority

"If there is an airport within 13km of the proposed waste facility, the airport shall be consulted at an early stage of planning."

Cork airport is approximately 12.5km from the site. The Irish Aviation Authority was consulted in the course of preparation of the EIS and planning application.

3.2.9.12 Traffic Impact

"Impact from a transport perspective will be assessed including road access, network, safety and traffic patterns to and from the proposed facility in accordance with road design guidelines and/or relevant LA guidelines in relation to roads,"

The Ringaskiddy area is served by the N28 national primary route. The L2545 road, which forms the northern boundary of the site of the proposed development, connects to the N28 approximately 400m from the site's western boundary. TII (formerly NRA) proposes to upgrade the N28 which will improve the access to the site. The impact of the facility on road access, the road network, safety and traffic patterns has been assessed in the preparation of this EIS.

It is noted that the Port of Cork's proposals for a container terminal in Ringaskiddy, recently approved by An Bord Pleanála under register reference PL 04.PA0035, was accepted on the basis of the improving accessibility of Ringaskiddy for road-based transport, by virtue of completed improvements to the Southern Ring Road interchanges, permitted improvements to the Dunkettle interchange, and proposed improvements to the N28. The Port of Cork also

proposed to operate an intelligent transport management system to alleviate the road traffic impact associated with Port traffic (the Ringaskiddy Mobility Management Plan).

A similar approach to managing traffic movements during the operational phase is proposed for the Ringaskiddy Resource Recovery Centre i.e. Digital booking system and staff mobility management plan, whilst HGV movements during the construction phase will be restricted during the am and pm peak traffic periods. Refer to **Chapter 7** ***Roads and Traffic*** of this EIS and ***Appendix 7.2 (Mobility Management Plan)*** for further details.

3.2.9.13 Brownfield sites or sites offer the opportunities to integrate differing aspects of waste processing

> *"There are existing closed or uncommenced landfills which could be used for alternatives waste activities as they are considered brownfield sites; also, suitably zoned, other brownfield sites could be used for alternative waste activities. Sites that offer the opportunities to integrate differing aspects of waste processing will be preferred choices. This will ensure maximum efficiency of waste processing."*

The site of the proposed development is not a brownfield site. There is evidence that it was used as a borrow pit in the past. However, in accordance with zoning objective ZU 3-7 of the CDP, the site is appropriately zoned for industrial use and is in the Strategic Employment Area of Ringaskiddy, which is where strategic large scale waste producing facilities are located. The site of the proposed development offers opportunities to integrate differing aspects of waste processing. The site is also adjacent to the Hammond Lane Metal Recycling Company Ltd premises. Hammond Lane is engaged in ferrous metal recycling, primarily from end-of-life vehicles. This is a waste recovery activity. The proposed development will be able to treat certain waste streams from the Hammond Lane activity and the recovered ferrous metals from the proposed development would be suitable for recycling by Hammond Lane.

There are also potential added synergies with the emerging energy cluster associated with the adjacent IMERC facility. The energy generated by the proposed development will be renewable energy.

3.2.9.14 European Sites

In relation to European Sites, the following criteria are to be considered:

> *"Avoid siting waste infrastructure or related infrastructure in European Sites including Special Areas of Conservation (SACs) and Special Protection Areas (SPAs);"*

The site is not designated as a candidate Special Area of Conservation [cSAC] or a Special Protection Area [SPA]. The nearest designated site is the Cork Harbour special protection area, the nearest point of which is located approximately 500m to the south of the site. The potential impact of the project on designated and European sites is considered in **Chapter 12,** ***Biodiversity*** of this EIS and the NIS respectively, which accompany this application. The NIS appraisal has concluded that there will not be any adverse effect on the integrity of any designated sites in the vicinity of the proposed development.

3.2.9.15 Appropriate Assessment

> *"Undertake Appropriate Assessment Screening for all waste related activities requiring development consent e.g. new infrastructure, expansions and upgrades of existing infrastructure and activities, waste authorisation applications, licence reviews (CoR WFP, and Licences);"*

A composite Screening Report and Natura Impact Statement has been submitted with the application for permission in relation to the proposed development, which provides information to the Board (as competent authority) to undertake Stage One Screening and, as required, a Stage Two Appropriate Assessment.

> *"Where a significant effect on a European Site, either alone or in combination with other plans or projects, is identified, or where there is uncertainty with regard to effects, the competent authority will seek a Natura Impact Statement to inform an AA. In so doing, the implications for any European Site in light of the site's Conservation Objectives shall be considered."*

A Natura Impact Statement has been prepared for the proposed development and has been submitted to the Board with the application for permission. The NIS concludes that there will not be any adverse effect on the integrity of any European sites in the vicinity of the proposed development.

3.2.9.16 Linear Habitats

> *"Avoid damage to features of the landscape which, by virtue of their linear and continuous structure or their function as stepping stones, are essential for the migration, dispersal or genetic exchange of wild species."*

The site of the proposed development does not form part of a feature which is essential for the migration, dispersal and genetic exchange of wild species. The potential impact of the project on flora and fauna is assessed in **Chapter 13, *Soil, Geology, Hydrogeology, Hydrology & Coastal Recession*** of this EIS. This has concluded that there will not be a significant effect on the migration, dispersal or genetic exchange of wild species.

3.2.9.17 Climate Change Adaption

The SRWMP makes reference to climate change adaption and the future development of a National Adaption Framework. With reference to the waste sector, the SRWMP states:

> *"Specific adaption measures are likely to include restrictions or modifications to facilities operating within or adjacent to areas of flood risk eliminating the risk of leachate or contaminated run off entering water courses. Similarly, for waste facilities located in coastal areas adaptation measures for sea level rise may include specified engineering works to mitigate erosion and potential impacts on coastal waters and protected ecological areas. The National Adaptation Framework will be reviewed on a five year basis and should be used to identify existing sites that are vulnerable to climate change stresses as well as for the development of a policy to restrict the development of waste operations in areas of high vulnerability. The environmental criteria take account of potential impacts from climate on waste facilities."*

The design of the proposed facility has addressed the implications of sea level rise due to climate change. Ground levels will be raised to above the 1 in 200 year tidal flood level, with an allowance for sea level rise due to climate change included. Coastal protection measures have also been incorporated into the design.

The suitability of the site in the context of other relevant international guidance on the siting of waste facilities is considered in **Appendix 3.1**.

3.2.9.18 Planning Context of the Site of the Proposed Development

Through land use zoning objective ZU 3-7 (c), the CDP directs strategic large scale waste treatment facilities to 'Industrial Areas' designated as Strategic Employment Areas in the local area plans subject to the requirements of national policy, future Regional Waste Management Plans and the objectives set out in local area plans.

Policy objective EE 4-1 of the CDP identifies Ringaskiddy as one of 5 no. Strategic Employment Areas in the County, the others being Carrigtwohill, Kilbarry, Little Island, and Whitegate.

Ringaskiddy is identified as a Strategic Employment Centre, focused on industry, in the Carrigaline Electoral Area Local Area Plan 2011.The strategic aims for Ringaskiddy are to reaffirm its strategic industrial and port related roles and seek to promote its potential for large-scale stand-alone industry.

From a waste and planning policy perspective, and consistent with Ireland's National Planning Policy Statement 2015, the proposed Resource Recovery facility in Ringaskiddy is plan-led, for the following reasons:

- National and regional waste policy advocate self-sufficiency and the proximity principle in the provision of waste management infrastructure for the State.
- Regional waste policy records a regional imbalance in the provision of such infrastructure.
- National and regional planning policy support the development of Cork with the largest concentration of population outside the Dublin area.
- Local planning policy in Cork directs large scale waste treatment facilities to Industrial Areas that are designated as Strategic Employment Areas.
- Ringaskiddy is an Industrial Area and is designated as a Strategic Employment Area.

Section 6.4.1 and Policy Objective EE 4-1 of the CDP explains that Strategic Employment Areas are a key component of the economic infrastructure supporting the Cork Gateway, and that they play an important role in the development of internationally attractive 'clusters' of economic activities. It is an objective of the Plan to promote the development of Strategic Employment Areas suitable for large scale developments at Carrigtwohill, Kilbarry, Little Island, Ringaskiddy and Whitegate where such development is compatible with relevant environment, nature and landscape protection policies as they apply around Cork Harbour. Lands in these areas also require protection from inappropriate development which may undermine their suitability as Strategic Employment Areas.

Like Ringaskiddy, the Strategic Employment Areas of Carrigtwohill, Kilbarry, Little Island and Whitegate are also Industrial Areas.

In planning terms, these Strategic Employment Areas are generally of similar status from the perspective of their zoning, strategic function, accessibility

(existing or planned), availability of lands, and services infrastructure (existing or planned).

The proposed development site in the Ringaskiddy Industrial and Strategic Employment Area is being advanced as the preferred location for the proposed development on the basis that:

- The site forms part of a strategic zoned industrial land bank, with a specific objective for stand-alone industry, in the Cork Metropolitan area, at sufficient remove from concentrations of population, but in close proximity to the existing waste pre-treatment facilities for municipal waste, which are generally located east of Cork City.
- An operating licence was granted by the EPA for the operation of a waste-to-energy facility for MSW, hazardous and industrial waste on the site. The granting of a licence confirmed that the EPA concluded that the site was suitable for a waste-to-energy facility;
- The site was previously determined to be suitable for the treatment of hazardous and industrial waste. Planning permission was granted by An Bord Pleanála for a waste-to-energy facility to treated hazardous and industrial waste in 2004. In response to Indaver's 2008 planning application, in 2010, in a letter to Indaver, An Bord Pleanála said that the proposed location may be generally suitable for a waste-to-energy facility to treat hazardous waste subject to the submission of revised drawings and particulars and a revised EIS. In refusing permission for the 2008 application, the grounds for refusal cited by An Bord Pleanála related to the particulars of the proposed development and not any perceived unsuitability of the site location for a waste-to-energy facility.
- The site is located in an emerging alternative energy cluster in Ringaskiddy, and there is significant potential to maximise the contribution of the proposed development to this cluster of renewable energy and to the renewable energy sector in general.
- The policy environment for the treatment of MSW waste has changed significantly since 2008, with an identified need for adequate and active treatment in the Region.
- The proposed development site is owned by Indaver and is of sufficient scale to accommodate the Ringaskiddy Resource Recovery Centre.

3.2.9.19 Findings and Conclusion of the 2015 Site Suitability Review

The site of the proposed development was selected in 2000. Developments have taken place in the Ringaskiddy area between 2000 and 2015 and further developments are proposed. However none of these have implications for the suitability of the Indaver site for the proposed resource recovery facility.

The current proposed resource recovery facility differs in design, layout and massing from previous development proposals. None of these changes render the site unsuitable.

The Cork County Development Plan 2014 directs large scale waste treatment facilities to Industrial Areas that are designated as Strategic Employment Areas.

Ringaskiddy is one such area. In this regard, the location of the proposed development in Ringaskiddy is plan-led.

The site forms part of a strategically-zoned industrial land bank, with a specific objective for stand-alone industry, in the Cork metropolitan area, and at sufficient remove from concentrations of population.

A licence was granted by the EPA for the operation of a waste-to-energy facility to treat MSW, hazardous and industrial waste on the site. The granting of a licence confirms the suitability of the site for this technology.

The site was previously determined to be suitable for a facility to treat hazardous and industrial waste. As noted in Section 3.2.6 above, one of the grounds for refusal of the planning application submitted in 2008 was that the facility was not compatible with the Waste Management Strategy for the region or the Waste Management Plan for County Cork, 2004. However, these plans have since been replaced by the SRWMP which calls for additional waste-to-energy capacity.

The suitability of the site was evaluated with respect to the environmental protection criteria, contained in the SRWMP, to be considered for waste facilities. To comply with the CDP zoning objectives it has not been possible to avoid siting the facility in an area with a landscape protection designation. However, as required by this criterion in such circumstances, an impact assessment has been carried out and mitigation measures put in place in compliance with this criterion. A very small part of the site is at risk of tidal flooding. The facility has been designed to prevent future flooding and accordingly the criterion has been addressed. Thus all of the environmental protection criteria in the SRWMP have been addressed.

The site is located in an emerging alternative energy cluster in Ringaskiddy. There is significant potential to maximise the contribution of the proposed development to this cluster of renewable energy and to the renewable energy sector in general.

The proposed development site is owned by Indaver and is of sufficient scale to accommodate the Ringaskiddy Resource Recovery Centre.

3.2.10 Other Sites Considered

3.2.10.1 Bottlehill

Cork County Council developed a landfill on a circa 100ha site at Bottlehill, in Co Cork. Bottlehill is close to the N20, between Cork and Mallow. The site infrastructure at Bottlehill, including the approach road, and one landfill cell was constructed. However, Cork County Council no longer provides waste management services and the facility has not opened.

In 1999/2000 the Bottlehill site was not available for consideration by Indaver. Currently, Bottlehill is not suitable for large-scale waste infrastructure, but the Cork County Development Plan aims to support the sustainable development of the Bottlehill facility for specialised and appropriate uses primarily associated with integrated waste management. This suggests that in the future, Bottlehill will be used for a range of specialised waste management activities. Cork County Council has recently sought formal expressions of interest for Bottlehill. Indaver

submitted a tender proposal to CCC to operate the landfill at Bottlehill, as it would be a good site to treat the bottom ash produced by the proposed development. Proposals are currently being reviewed and it is anticipated that an agreement will be reached in 2016. Refer to the Planning Report which forms part of the planning application.

3.2.10.2 Review of Suitability of Bottlehill for the Ringaskiddy Resource Recovery Centre

Planning and Zoning

Having regard to the provisions of the Cork County Development Plan 2014, Bottlehill is not identified as an Industrial Area, nor is it designated as a Strategic Employment Area. According to objective ZU 3-7, the provision of strategic large scale waste treatment facilities including waste-to-energy recovery facilities will only be considered in 'Industrial Areas' designated as Strategic Employment Areas in the local area plans.

By comparison, the policy objective for Bottlehill, as contained in policy objective WS 7-1 of the Cork County Development Plan, 2014 is to support the sustainable development of the Bottlehill facility for specialised and appropriate uses primarily associated with integrated waste management. The specialised and associated role of Bottlehill in the provision of waste management activities is therefore clearly identified in local planning policy, whereas the policy for large scale waste infrastructure is that their preferred location is in industrial areas that are also Strategic Employment Areas. From a policy perspective, Bottlehill is clearly not a suitable alternative location for the proposed development. Instead, and in accordance with policy objective WS 7-1 of the Plan 2014, Bottlehill could play a supporting role within the context of an integrated waste management service for the County.

Proximity to waste producers and population

The proposed development site in Ringaskiddy is located closer to the main producers of hazardous waste, which are in the Harbour area. Little Island and Ringaskiddy itself are home to a cluster of multinational pharmaceutical companies, the producers of the hazardous and non-hazardous industrial waste streams the proposed waste-to-energy facility would treat.

Proximity to users of heat

Currently there are no potential users of the heat in the vicinity of the Bottlehill site, which is located in a rural area with no substantial industrial or residential development. In contrast, as outlined in section 3.2.5 above, there are several large heat users within 3km of the Ringaskiddy site. The Energy Efficiency Directive (2012/27/EU) promotes the use of cogeneration, district heating and cooling, and waste industrial heat recovery. The consideration of waste-to-energy facilities in local heat plans and their potential connection to local heat networks is of importance for improving the overall efficiency of energy generation, while also supporting the goals of the Energy Efficiency Directive.

There are a number of regulatory uncertainties and funding issues to resolve prior to the development of a heat distribution network. Therefore, district heating is not part of the current proposal but it will be considered by Indaver in the

future. It is envisaged that the waste-to-energy facility will be initially developed with the same design as the Meath waste-to-energy facility e.g. with focus on electricity production. However, full flexibility will be built into the design to facilitate its operation for both heat and electricity production if it became possible to progress with the heating supply network.

3.2.10.3 Gortadroma, Co. Limerick

In the spring of 2015 plans were unveiled for a waste-to-energy facility at a closed landfill at Gortadroma in Co Limerick. Gortadroma is a considerable distance from the main producers of hazardous waste in Cork Harbour and from the Cork City population centre. For these reasons the Gortdromma site is not considered an appropriate site for the Indaver facility. Again, there are no potential users of the heat in the vicinity of the Gortadroma site, which is located in a rural area with no substantial industrial or residential development. However, as outlined in section 3.2.4 above, there are several large heat users within 3km of the Ringaskiddy site.

3.2.10.4 Kilbarry, Cork City

Land at Kilbarry, on the north-western outskirts of Cork City, is zoned industrial and is designated as a Strategic Employment Area. Under Objective ZU 3-7 of the CDP, a site in this Strategic Employment Area would be open for consideration for large scale waste treatment facilities including waste-to-energy recovery. Kilbarry was not included in the 1999/2000 site selection process. However, in the light of Objective ZU 3-7, a review was undertaken of Kilbarry as a potential site for the Ringaskiddy Resource Recovery Centre.

IDA Ireland owns the Kilbarry Business and Technology Park, a 55ha site at Kilbarry. The park accommodates light industrial units and offices. There are unused, serviced sites in the park. IDA land is reserved for incoming foreign direct investment and is not available for purchase for infrastructure. While there are light industrial units in other industrial estates adjacent to the N20, to the west of the Kilbarry area, there are no major industries, which might be potential heat or steam users. The road network serving the Kilbarry is very poor. The access roads from the N20, the nearest national primary route, are narrow and poorly aligned. If the Cork Northern Ring Road were to proceed, it would improve the road network in the area. However, there is no published timeframe for this road to proceed to the planning stage.

Due to the poor road network and lack of other large industries in the area, Kilbarry is not considered a suitable site for the Ringaskiddy Resource Recovery Centre.

3.3 Additional Project Alternatives Considered

3.3.1 Alternative Waste Management Options

This section deals with the alternative treatment options that were considered by Indaver that would meet the identified need for thermal recovery in the SRWMP.

When examining the types of technology that would be most appropriate for the Ringaskiddy Resource Recovery Centre, Indaver considered the characteristics of the Irish waste market.

The policy as outlined in **Chapter 2 *Planning*** of this EIS identified a need for 300,000 tpa capacity MSW thermal recovery. While a standalone MSW incinerator is possible in need terms, this did not fulfil policy or market needs in the area.

As outlined in **Chapter 2 *Planning*** of this EIS, the SRWMP also describes a need for thermal treatment of 50,000tpa hazardous waste and an unspecified amount of industrial waste. Indaver provides an Industrial Waste Service to the chemical and pharmaceutical market. Waste from this market forms part of the hazardous waste arising within Ireland that requires thermal treatment. In addition, the same industries produce industrial sludge and industrial non-hazardous waste.

Though Indaver considered the possibility of treating only hazardous industrial waste, this is generated in such quantities that running a dedicated incinerator for this waste would not be economically viable.

Therefore waste streams considered for this project include household, commercial, industrial, hazardous and non-hazardous waste. In this way the facility would be optimised both from an economic and technology perspective in line with policy and environmental benefits. This determined the requirement for a proven technology to treat a broad range of waste streams.

The Irish market for waste disposal is relatively small by international standards and is also varied in its composition. Because of this, Indaver determined that the design of the waste-to-energy facility, and of the technology to be chosen, must be robust and also flexible enough to be able to adapt to changing waste streams and market conditions that may arise in the future.

Alternative technologies are considered in more detail in section 3.4 of this chapter.

3.3.2 Export for Energy Recovery

An emerging trend in Ireland within the waste market at present is the export of residual municipal waste for recovery in waste-to-energy facilities in other Member States of the EU. This option has enabled Ireland to continue to reduce the amount of waste consigned to landfill even in the absence of development of any further recovery capacity, at a low cost to the consumer.

However, the Regional Waste Plans are clear in highlighting the risk of relying on export outlets for residual waste treatment as outlined in Section 2.2.3 of the EIS. In particular, it leaves Ireland exposed to market shocks, price increases and potential enhanced regulatory controls tied to destination countries. It also means Ireland cannot achieve self-sufficiency in residual waste treatment, a key objective in European waste policy. Finally, the export of waste represents a loss in revenue to the economy which is compounded by the loss in the valuable energy resource in the waste.

Accordingly, the preference of local authorities in all regions is to support self-sufficiency and the development of indigenous infrastructure for energy recovery from residual municipal waste. The proposed resource recovery centre at Ringaskiddy will enable the authorities to achieve this by delivering local energy recovery capacity.

In 2014, Indaver exported 78,003 tonnes of baled residual municipal waste through the Port of Cork. The residual waste was transported from locations within the city and in the county of Cork, accounting for approximately 4,166 truck movements to the city quays.

The Ringaskiddy Resource Recovery Centre would eliminate the need for this export and corresponding traffic. Any impacts of additional traffic on the local Ringaskiddy infrastructure is outweighed by the environmental advantages of developing badly needed waste management infrastructure. As outlined in **Chapter 2, *Planning*** of this EIS, the provision of this waste-to-energy capacity supports diversion from landfill, climate change mitigation and renewable energy targets.

3.3.3 Waste Transfer Station Option

The provision of a waste transfer station, as a separate piece of infrastructure, was contemplated as a possible aspect of this project, but ultimately not included. A transfer station is not required for the operation of the proposed development, as is evidenced by the Meath waste-to-energy facility, which accepts the same waste streams as the proposed development in Ringaskiddy, but does not have a transfer station. There are already transfer stations in Dublin, Shannon, Cork and Portlaoise.

A transfer station is a pre-treatment facility, the purpose of which is to provide temporary storage, sorting, and repacking if necessary, of industrial hazardous and non-hazardous waste. Such a transfer station would have a throughput of circa 15,000 tonnes of waste per annum. The main elements of any such waste transfer station would comprise a service yard and parking area for trucks, a warehouse for packaged wastes and a tank farm. Material for recovery would be repacked where necessary and exported to licensed facilities. Material that is not suitable for recovery, or for incineration on site, would be prepared in lots for shipment to the appropriate disposal facilities abroad.

The applicant reiterates that a waste transfer station is not envisaged for the Ringaskiddy site at this time and that no permission is sought for such a waste transfer station on this application for consent.

3.3.4 Alternatives for Upgrading the L2545 Road and Providing Flood Protection

The flood risk appraisal undertaken on behalf of the applicant has concluded that the L2545 road is at risk of pluvial flooding due to inadequate road drainage. The road level, in the vicinity of the Indaver site is below the 1 in 200 year design tidal flood level.

Two options were considered for upgrading the L2545 road. The first option was to raise the level of the road along part of the frontage to the Indaver site, to

above the 1 in 200 year design tidal flood level plus an allowance for climate change, and to upgrade the road drainage. The second option was to construct a flood wall or embankment on the eastern side of the car park and to upgrade the road drainage.

The first option was chosen as it would give a high level of flood protection to the road. This was also the preferred option of the Cork County Council roads engineers, who were consulted. The second option would require a ramp to allow access to the beach. The road would have to be excavated to upgrade the drainage. Reinstating the road at the lower level was not preferred.

3.3.5 Coastal Erosion Protection

The coastline along the eastern boundary of the Indaver site consists of a glacial till face adjoining Gobby Beach. The glacial till face is very shallow near the public car park to the north and steepens to the south to a maximum of 10-12m high. Issues in relation to coastal erosion were raised by An Bord Pleanála during the course of the 2008 planning application process. In response to the issues raised by the Board, a coastal study was carried out by Arup in order to better understand the coastal processes in the vicinity of the site, the rate of erosion of the glacial till face and the specific coastal protection measures required. The coastal erosion study undertaken included an evaluation of the retreat rate of glacial till face based on historical information and surveys. Numerical wave modelling, a wave run-up assessment and beach sediment transport assessment were carried out.

The study found that the proposed development would not increase the current rate of erosion of the glacial till face.

As part of the study, a very conservative rate of erosion was applied to the site in order to assess whether the proposed development could be impacted over the duration of the planning permission (40 years in total). The study found that there would be no impact on the proposed development after 30 years. The study found that there could be a risk of an impact on a small section of the proposed development after 40 years however this would be confined only to the amenity walkway and a small section of a diverted gas pipeline outside of the fence line. The waste-to-energy facility would not be impacted by coastal erosion during the duration of the planning permission.

Indaver engaged with Gas Networks Ireland (GNI) in relation to the proposed diversion route within the Indaver site. GNI confirmed that they were satisfied that the proposed gas diversion route was feasible.

Coastal protection mitigation measures are not required for the waste-to-energy facility element of the development. However, given the concerns raised by An Bord Pleanála and given the low risk that the amenity walkway and a section of the diverted gas pipeline could be impacted in 40 years' time, coastal protection measures have been included in this planning application as a precautionary measure so as to reduce the rate of erosion of the glacial till face.

A total of 10 No. options were considered for the protection of the glacial till face from erosion. Refer to **Table 3.4** below

The preferred option was the placing of sacrificial beach material (shingle) at the toe of the glacial till face on Gobby Beach. This will be a 'soft' solution, which will:

- Reduce erosion rates by increasing beach levels i.e. reducing near shore water depth and wave heights
- Protect the glacial till face from breaking waves
- Comprise a very natural way of slowing coastal erosion
- Require less material than conventional beach nourishment
- Located within the Indaver site boundary
- Not affect the current state of the glacial till face (no need for re-shaping)
- Not have any negative impact on the existing structures in the vicinity and adjoining areas (glacial till face and beaches)
- Protect the site and also the adjoining areas to it, so it is beneficial for the entire coastline
- Enhance the amenity and recreational aspects of the area, providing additional beach area at high tide
- Enhance the visual appearance of the beach
- Provide an adaptive approach to the erosion and retreat issues of the coastline while working with nature
- Promote the growth (accretion) of the beach as material is free to move in the coastal cell (bay)
- Protect the beach clay layer from further erosion.

Further details on the coastal protection measures are provided in **Chapter 13 *Soils, Geology, Hydrogeology, Hydrology and Coastal Recession*** of this EIS.

Table 3.4 Coastal Engineer Solutions Considered

	Technique	Advantages	Disadvantages
Detached Breakwaters	Intermittent structures made of a loose material core which is covered with a resistant outer skin composed of rocks or concrete units. It is constructed in the wave breaking zone.	Dissipate wave energy further seaward than under natural conditions. Encourage beach build-up at the shoreline in the lee of the structure.	May pose as a hazard to vessels navigating the waters, however, it is envisaged the breakwaters would not be a hazard to ships in this case.
Sills	Un-segmented, structures parallel to the shore, always or occasionally submerged, usually built of rock and designed to hold beach material on their landward side.	They alter the cross shore sediment transport, preventing offshore loss of sediment resulting in a perched beach behind the sill. They also absorb some of the wave energy reaching the glacial till face.	Risk to small craft users and swimmers due to submerged structure. May trap sand that would have deposited at other beaches. May cause some scour of the beach immediately to the seaward.

	Technique	Advantages	Disadvantages
Groynes	Narrow structures built usually at right angles to the shoreline which can be made of timber piles, rock, sheet pilling and concrete. They extend across the beach but rarely below the low water mark	Hold back sediment that would otherwise move along the beach under the action of waves and long-shore currents. Results in the accumulation of sand on the updrift side of the groyne to protect the coastline	Can increase the erosion along the down drift shoreline.
Revetment	Revetments are a means of protecting soft glacial till face and slopes from wave impact forces. The most common methods are with rock armour or gabions.	Reduce wave impact energy on the glacial till face or coastal slope.	Visually intrusive and may be hazardous to beach users if the rocks are very large. Requires beach access for construction.
Sea Walls	Vertical or near vertical walls, usually built at the high water mark between the shore and the land from concrete or stone.	They can reflect or absorb the wave impact energy and prevent erosion.	Visually intrusive and may prevent access to the beach or sea. Prevent normal development of the shoreline and may hamper strand line flora and fauna.
Bulkheads	Vertical retaining walls with either cantilevered or anchored sheet piles or gravity structures.	Reduce land erosion and loss to the sea by preventing soil from sliding seaward.	They commonly cause a change to the beach profile, normally resulting in sediment deposits along the shore where the bulkheads end.
Glacial till face Strengthening	Applied above the tidal zone for soft rock or exposed glacial till faces, techniques include the provision of drainage lines within the glacial till face to minimize moisture or planting suitable vegetation on the exposed face of the glacial till.	Reduce mass failure of glacial till face by increasing the material strength or decreasing the strain forces put on them.	Can have an impact on the ecology or land use at the top of the glacial till face (not expected for Indaver site). Can have an impact on shoreline sediment budgets. However, considering the short length of the exposed glacial till face at the Indaver site this would only be minor.
Beach Nourishment	Artificially adding material to the beach in order to overcome a deficit in the sediment budget.	Protects the glacial till face from breaking waves. Regarded as a very natural way of combating coastal erosion.	Long-term maintenance effort usually required. Cause of the erosion is not eliminated as beach material is sacrificed with time.

	Technique	Advantages	Disadvantages
Sacrificial beach material (shingle) at the toe of the glacial till face	Artificially adding material to the beach above the foreshore in order to protect the toe of the glacial till face from wave action	Protects the glacial till face from breaking waves. Regarded as a very natural way of combating coastal erosion. Less material than conventional beach nourishment needed	Long-term maintenance effort usually required. Cause of the erosion is not eliminated as beach material is sacrificed with time.
Planting	On the glacial till face, grass, bushes and trees protect the glacial fill against surface erosion by rain and melt-water.	Landslides on the glacial till slope are reduced by the presence of planting.	In isolation they are generally not sufficiently effective. Vegetation may fail due to environmental conditions May be successful in low energy environment but not for example on the open coast.

3.3.6 Construction Phasing

3.3.6.1 General

The main construction phasing options that were considered were the timing of the road upgrade works, the re-grading and earthworks on the eastern area of the site, raising the level of the western field, and the placing of the sacrificial beach material.

3.3.6.2 Earthworks and construction of the retaining structures

The proposed layout of the waste-to-energy facility requires the eastern area of the site to be re-graded to form a series of terraces. A number of soil and rock retaining structures will be constructed as part of the terraces. The earthworks and construction of the retaining structures could happen at the same time as the construction of the waste-to-energy facility. However, this would involve a considerable number of different operations, undertaken by different contractors, happening at the same time. Also there would be a significant amount of truck movements associated with the earthworks.

Accordingly, it is proposed that the earthworks and the construction of the retaining structures should be undertaken prior to the construction of the waste-to-energy facility. This will reduce the number of concurrent site operations and avoid the potential cumulative traffic impacts associated with the simultaneous phasing of earthworks with the construction of the waste-to-energy facility.

3.3.6.3 Road upgrade works

There were a number options considered in relation to the phasing of the road upgrade works, which could be undertaken before, during or after the earthworks on the eastern area of the site, or before, during or after the construction of the

waste-to-energy facility. It will be necessary to construct a temporary road on the Indaver site to the south of the existing road, on which to divert traffic, for the duration of the road upgrade works. The temporary road would be a major constraint on the earthworks and on the construction of the waste-to-energy facility. Also the earthworks will have to tie into the new road level. This would be facilitated if the new road is constructed in advance of the earthworks.

For these reasons it is proposed that the road upgrade works be undertaken as the first construction activity.

3.3.6.4 Raising the level of the western field

Again, raising the level of the western field could be undertaken before, during or after the earthworks on the eastern area of the site, and before, during or after the construction of the waste-to-energy facility. It is proposed that the western field would be used for the construction compound and for construction laydown and parking.

To minimise the quantity of imported fill, it is also proposed that material, excavated from the eastern area during the earthworks phase, would be reused, if suitable, to raise the levels in the western field. To achieve this reuse, if raising the level of the western field is undertaken after the earthworks, it would be necessary to stockpile the suitable material. The stockpiles would constrain the earthworks and the construction of the waste-to-energy facility.

Consequently, it is proposed that raising the level of the western field is undertaken at the same time as the earthworks.

3.3.6.5 Placing of the sacrificial beach material

The placing of the sacrificial beach material would not impact directly on or constrain any of the construction activities discussed above. The road upgrade works would constrain the placing of the sacrificial beach material and it would be preferable if those two elements of the works did not coincide. The initial placement will be of 1,100m^3 of material which will result in approximately 100 number of truck movements.

Consequently, it is proposed that the placing of the sacrificial beach material will be undertaken towards the end of the construction of the waste-to-energy facility, when truck movements associated with the proposed development have substantially reduced.

3.4 Alternative Thermal Treatment Technologies

Alternative thermal treatment technologies were considered by Indaver. The key elements of these technologies, together with their respective merits and demerits are set out below, under the following headings:

- Pyrolysis and Gasification
- Waste combustion with energy recovery.

It should be noted that only technologies that are in accordance with the requirements of EU Industrial Emissions Directive were considered by Indaver.

3.4.1 Pyrolysis and Gasification

Two technological alternatives for thermal treatment of municipal solid waste are the advanced thermal conversion technologies of pyrolysis and gasification.

Pyrolysis is the thermal degradation of a material in the complete absence of an oxidising agent (typically air). The by-products, char, pyrolysis oil and pyrolysis ash can be used as a fuel for energy production. Gasification is the conversion of a solid or liquid feedstock into combustible gas by partial oxidation under the application of heat and water. The gas can be used as fuel in boilers, combustion engines or gas turbines.

There is still only very limited operational data available for the gasification or pyrolysis of residual municipal waste. The BREF on Waste Incineration does not include any BAT for either technology. In the absence of any standards or data, it is difficult to compare this technology with conventional thermal treatment technology.

However, indications are that advanced thermal conversion technologies have the potential to produce lower environmental emissions, have a smaller footprint and can offer a range of different types of energy products from municipal wastes.

Facilities for gasification or pyrolysis of residual municipal waste typically require waste pre-treatment (shredder and iron removal). This requires additional handling and energy input into the waste prior to treatment.

Some of the advantages of pyrolysis include a lower volume of flue gas because of a lower excess oxygen rate with the combustion of pyrolysis products. Energy can be stored for later use in the form of oils or char. There is a reduction in the formation of dioxins or furans at the early stages however the overall levels are similar to conventional incineration. Pyrolysis also leads to the production of gas with lower calorific value which may be combusted with short retention time and low emissions. Furthermore, pyrolysis can lead to better retention of heavy metals in the char than in ash from conventional combustion.

However, a significant disadvantages of pyrolysis is the lack of long term operating experience from large scale facilities. The technology has proved to be more suited to single, homogeneous waste streams rather than residual MSW. Residual MSW would require extensive pre-treatment via shredding and homogenisation prior to entering pyrolysis unit. The char and oils contain heavy metals and other components and require further treatment (as waste) in a solid fuel boiler or gasifier. These energy products require pre-scrubbing or extensive flue gas cleaning depending on the final use as gas for gas engines or gas for chemical synthesis. Thus the energy recovery efficiency may be lower than in a grate furnace.

Some of the advantages of gasification include less CO_2 production because of potentially better energy yield compared to traditional waste incineration. There can be less flue gas (quantity) than from grate furnace technology because of lower excess oxygen in the final oxidation of the gasification products. The energy product (e.g. syngas) can be stored for later use. If the solid fraction is vitrified there is better retention of heavy metals in the ash. Gasification also

produces gas with lower calorific value which may be combusted with short retention time and low emissions.

However, again a significant disadvantage of gasification includes the lack of long term operating experience from large scale facilities. It is more useful for single, homogeneous waste streams rather than mixed MSW which would require extensive pre-treatment via shredding and other mechanical treatment prior to entering gasifier unit.

A part of the oxygen needed for gasification is supplied by means of pure oxygen, which is expensive and energy intensive to produce. Gasifiers need support energy, especially when the energy content of the waste is low. This energy is supplied by coke or by electric torches. Gasification technology involves more complicated emergency stop procedures (more combustible/ explosive/toxic gases in the system in the event of an emergency stop) which can reduce long term reliability. The energy recovery efficiency may be lower than grate furnace. The gas remains classified as a waste and must be treated in line with the Industrial Emissions Directive. Aluminium cannot be recovered from the metal melt as it is bound within the slag, unlike ash from grate furnace technology. Finally the syngas produced requires pre-scrubbing before it can be used in gas engines for electricity production.

Finally, indications are that gasification and pyrolysis technologies are more difficult to maintain under stable operating conditions with a variable fuel like waste.

Overall, due to the range of residual waste streams to be handled at the Ringaskiddy Resource Recovery Centre, the robustness of the technology and the focus on energy recovery, it was decided not to develop the facility applying pyrolysis and gasification technology.

3.4.2 Waste Combustion with Energy Recovery

Waste combustion involves the reduction of municipal waste-to-approximately 5-10% of its original volume. The thermal energy generated is recovered as steam which can be used to generate electricity, directly in heat applications or in a combination of heat and power facility. The process leads to the production of flue gas cleaning residues which either require further treatment or deposition in a controlled landfill.

The principal technologies used for waste combustion are grate combustion, fluidised bed and rotary kiln systems. Liquid injection systems can be used for liquid wastes. These are discussed below.

3.4.2.1 Grate Combustion

Moving grate furnaces operate in a similar fashion to an escalator, pushing waste from the top of the furnace to the bottom to ensure complete combustion. The moving grate mechanism transports the waste slowly from the feed point at the top of the furnace to the ash discharge at the bottom of the furnace. The residence time for waste in a grate furnace is typically approximately one hour.

As grate combustion is the chosen technology as discussed in detail in **Chapter 4 *Description of the Proposed Development*** of this EIS**.**

The advantages of grate incineration include its proven reliability and its ability to handle all types of municipal and industrial waste. The total volume of waste is reduced to approximately 5-10%. Moreover, grate incineration is a CO_2 neutral production process. The energy recovery efficiency is over 80% (transferred to steam from the boiler). The ferrous and non-ferrous metals within the ash can be recovered and recycled. Grate incineration also has a lower capital cost than pyrolysis and gasification. However, the combustion process produces gases and dust which require an extensive flue gas cleaning system. Moreover, the energy output cannot be easily stored as it is in the form of steam. Finally, the flue gas cleaning residues require treatment at a facility suitable for hazardous wastes. Indaver successfully operates this type of incinerator technology at the Meath facility.

3.4.2.2 Rotary Kiln

A rotary kiln is an alternative waste combustion technology. The rotary kiln process consists of a refractory lined incinerator rotating very slowly (5-15 rev/hr). The cylinder is mounted at a slight incline so that solid materials introduced to the furnace will move from one end to be discharged at the other. A burner is located at the same end of the kiln as the waste feed and can be fired with gas, oil or waste solvents.

The main advantage of the rotary kiln design is the ability to treat a variety of waste streams such as solid wastes of varying sizes, liquid wastes using atomising burners, and wastes with high moisture contents. Rotary kilns are also efficient in the destruction of organic compounds.

The relatively high capital and operating cost of a rotary kiln incinerator and the kiln size limit of about 60,000 tonnes/annum means that a larger capacity unit is required to be economically viable. They are also not suitable for the treatment of sludge-like wastes or municipal solid wastes if no other types of waste are added.

Indaver NV successfully operates this type of incinerator technology at its facility in Antwerp.

3.4.2.3 Liquid Injection Systems

Liquid injection systems are an alternative technology for the combustion of liquid wastes. This type of incinerator is most commonly used for the combustion of chemical wastes such as oils and solvents, but it can also be used for the incineration of gases and sewage sludge. Liquid wastes are injected by means of an atomiser at one end of a refractory lined cylinder, where the waste is thoroughly mixed with the combustion air. The combustion temperature reaches 1100^{o}C (the temperature required for treatment of highly chlorinated waste), with a residence time of 1.5 to 2 seconds. The design may incorporate just one combustion chamber with a number of zones or multiple chambers.

Liquid wastes that are highly combustible are fired in the first zone/chamber along with waste gases, while incombustible liquids containing some solids such as sewage sludge can be introduced into the following zones/chambers where

the liquid fraction evaporates off and solid content burns. A liquid injection system can be installed after a rotary kiln or fluidised bed or directly into a grate incinerator. Indaver successfully operates a liquid injection system at the Meath facility.

3.4.2.4 Fluidised Bed System

A fluidised bed system is an alternative waste combustion technology. In a fluidised bed system the waste is mechanically pre-treated, usually by shredding and metals removal, with the resulting particulates being introduced into a fluidised sand bed and suspended in an upward airflow in the combustion chamber. This ensures uniform combustion conditions and is particularly suitable for efficient combustion of low grade fuels. An example is peat or sewage sludge combustion, where it is now the industry standard.

Fluidised bed systems requires a uniform waste feedstock (up to 150mm in size) meaning that the waste must be shredded/pre-treated prior to feeding. Fluidised beds work better when processing wet material, e.g. sludge. In short the major benefits of a fluid bed system do not outweigh the additional financial investment required, when only a small proportion of the total waste feed is sludge.

3.5 Rationale for Technology Selection

3.5.1 Influencing Factors in the Technology Selection

When examining the types of technology that would be most appropriate for the Ringaskiddy Resource Recovery Centre, Indaver considered a number of factors, which are set out below.

3.5.1.1 Characteristics of the Irish Waste Market

The Irish market for waste disposal is relatively small by international standards and is also varied in its composition. Because of this, the design of the waste-to-energy facility, and of the technology to be chosen, must be sustainable, with sufficient robustness and flexibility to adapt to changing waste streams and market conditions that may arise in the future.

3.5.1.2 Exclusion of Certain Incinerator Technologies

Indaver considered the numerous types of incinerator technology available as outlined in Section 2.7.1. However, a number of those technologies are not suitable for treating all types of waste streams. For example, it was felt that the volume of hazardous waste generated in Ireland was not sufficient to make the rotary kiln option economically viable.

3.5.1.3 Explanation for the Chosen Incineration Technologies

The Ringaskiddy Resource Recovery Centre will include a moving grate furnace for the treatment of municipal and industrial solid waste.

Indaver believes that this technology is the most appropriate for the range of materials to be accepted for recovery. Grate furnaces provide for the safe and efficient thermal treatment of wastes that are not suitable for reuse or recycling, while allowing flexibility in handling a wide range of waste types and in responding to changes in market conditions and waste streams generated in the future. There is no technical impediment to operating the facility significantly below its nominal design capacity.

An additional advantage is that the existing grate technology can handle liquid incineration, so there is no need for a separate liquid incineration installation.

Furthermore, grate furnace technology can provide for a high degree of energy efficiency compared with some other options, and therefore will meet the R1 recovery criteria with either electricity or heat exports or both. Indaver has demonstrated the capacity to treat liquid waste in this way at the facility in Meath.

The chosen furnace type is explained in more detail in **Chapter 4 *Description of the Proposed Development*** of this EIS.

3.6 Alternative Energy Recovery and Gas Cleaning Systems

Indaver considered a range of energy recovery and flue gas cleaning technologies for the Ringaskiddy Resource Recovery Centre, with a view to optimising energy recovery and choosing technologies that would be well proven, robust and easy to operate.

3.6.1 Heat Recovery and Use

The following energy recovery alternatives to electricity generation are discussed below:

- No heat recovery
- Hot water generation for export via a heating network / use onsite
- Steam generation for export via a heating network / use onsite

No Heat Recovery

Incineration without heat recovery has not been considered as an alternative, as incineration without heat recovery is not considered to be a Best Available Technique (BAT).

Hot Water/Steam Generation

The boiler chosen for the Ringaskiddy Resource Recovery Centre provides steam at a pressure of 40 bar and a temperature of 400°C, which is considered BAT. This will be used to generate electricity, but could alternatively be used to supply a high pressure steam pipeline if this were available. However, generally industrial or domestic heat demand would be for much lower temperatures and pressures (e.g. 80 – 120^{o}C) and therefore, the steam would have to be stepped down prior to distribution to steam or hot water end users. This can be achieved by designing the steam turbine to operate in combined heat and power (CHP)

mode, where steam is used to generate some electricity and is extracted at lower pressures and temperatures.

The location of the resource recovery centre on the Ringaskiddy Peninsula provides an opportunity to ultimately supply steam/hot water to large-scale industrial facilities, such as pharmaceutical and chemical facilities, and the large educational facilities located within 1 – 2 km of the site.

However, there are a number of regulatory uncertainties and funding issues to resolve prior to the development of a heat distribution network. Therefore, it is envisaged that the facility will be developed only to produce electricity from the steam generated. For clarity, heat exports and district heating are not part of the current proposal but it will be considered by Indaver in the future. In order to achieve sustainability, full flexibility will be built into the design to facilitate its operation as a CHP facility if and when it is possible to progress with a heating supply network.

3.6.2 Dust Removal System

Dust removal can be achieved using a variety of technologies in order to meet the requirements of Industrial Emissions Directive, such as:

- cyclone
- electrofilter
- baghouse filter

The most suitable option is dependent on process conditions and emission limits standards.

Cyclones can be used at temperatures up to 900°C. The efficiency is dependent on the particle size and density. Efficiencies of over 90% can be achieved for sand. However for fly ash it is unlikely to have a separation efficiency of more than 60%.

Electrofilters can be used at temperatures up to 400°C. The efficiency is dependent on the number of “electrical fields” installed. An efficiency of 95 % is common. However, achieving dust emissions below 3 mg/Nm3 has proven difficult.

Baghouse filters can be used at temperatures up to 200°C with high efficiency. Such filters achieve typical dust emissions of 2 mg/Nm^3 which compares favourably with the Industrial Emissions Directive which sets the limit at 10 mg/Nm^3. Due to the creation of a cake on the filter cloth it is possible to consider a baghouse filter as a reactor also for the removal of acid gases and further removal of dioxins and heavy metals. The outlet temperature from the cooling section is between 140 and 180°C, therefore this is an optimal location for a baghouse filter in the process.

Fly ash separation (dust removal prior to gas cleaning) has not been considered due to the very low volume generated. The advantage of separation would be the recovery or dispoal of fly ash without solidification with cement, however, this would be dependent on prior knowledge of the concentration of metals in the waste.

For the reasons outlined above it is therefore proposed to use a baghouse filter (which is considered BAT) for the removal of dust after the cooling section as the outlet temperature is optimal.

3.6.3 DeNOx

DeNOx can be achieved by either Selective Catalytic Reduction (SCR) or Selective Non Catalytic Reduction (SNCR). Both technologies are considered BAT.

SCR is more complicated to operate than SNCR. Ammonia is used as a reagent in the SCR process. As it requires fossil fuel (gas), it has a negative effect on the overall energy balance of the facility. As a result, a SCR system is more prone to technical difficulties and frequent, unscheduled, shutdown time. Advantages include an option to combine DeNOx with dioxin removal, efficient NOx removal and less effluent and residues.

SNCR is a less complicated system and is, therefore, more reliable and not as prone to technical difficulties and frequent, unscheduled, shutdown time. However, it does require a higher consumption of ammonia. Modern SNCR systems can achieve low NOx emission limits. SNCR does not require any additional energy input.

Two reagents can be used in such a DeNOx system: ammonia or urea. Urea is a chemical that decomposes to ammonia and carbon monoxide. It is safer to handle than ammonia. In an SNCR system, the carbon monoxide will be further oxidised to carbon dioxide because it is applied at temperatures of approximately 900°C. Urea allows a larger temperature range in which to react with NOx.

It is proposed to use SNCR with urea or ammonia injection as it is safer, more flexible and consumes less energy and therefore does not have a negative effect on the overall energy balance of the facility. This option is considered BAT.

3.6.4 Flue Gas Cleaning Options

The choice of the flue gas cleaning equipment depends on the feasibility of a liquid purge from the site and on the pollutant load in the flue gases.

A liquid purge from the site would allow the removal of the salts from the reaction of the flue gas pollutants (HCl and SO_2) with the neutralising agent (lime) by means of a scrubber purge. The scrubber purge would require treatment in a chemical water purification system before leaving the site as an effluent. The by-product of the chemical water purification would be a solid cake containing gypsum and heavy metals, which would be landfilled. The technology options would then focus on absorption of the flue gas pollutants (HCl and SO_2) in wet scrubbers. In case of low pollutant load, as is expected with the grate furnace, a single scrubber would be able to absorb the flue gas pollutants. In case of higher flue gas pollutants there would be a need for two scrubbers.

The main advantages of the effluent option are:

- no overconsumption of neutralising agents

- landfill capacity is not taken up with harmless salt coming from the reaction of HCl and SO_2 with lime, and
- lower stack emissions.

If a liquid purge is not feasible then the salts from the reaction of the flue gas pollutants (HCl and SO_2) with the neutralising agent (lime) would need to be removed in solid form as flue gas cleaning residue. This residue must be disposed of in a suitable facility. This means that the adsorption and reaction needs to be done in the semi-wet or semi-dry flue gas cleaning system. Semi-wet or semi-dry flue gas cleaning is able to absorb the flue gas pollutants. Semi-wet or semi-dry flue gas cleaning includes recirculation of the solid flue gas cleaning residue in order to improve the lime utilisation.

The main advantages of the effluent free option are:

- No effluent to be controlled on emission parameters.
- Lower capital cost.
- Better energy recovery rate.

Indaver considered Best Available Techniques (BAT) when assessing the potential technologies for the proposed facility. This necessitated the consideration of a flue gas cleaning treatment system which resulted in a liquid purge effluent discharge. Raw material usage and economics are taken into account when assessing a technology against BAT guidelines. In this regard, the large volumes of water required for the flue gas cleaning with an effluent discharge was considered not viable in terms of raw material use and economics. Other BAT options for flue gas cleaning which were also considered by Indaver do not include an effluent.

Options that do not include an effluent are semi-wet and semi-dry systems.

In semi-dry conditions, neutralizing agents in dry form together with a separately temperature controlled amount of water are used in unsaturated flue gas conditions.

In semi-wet flue gas cleaning, overall energy recovery is lower. In semi-wet conditions, neutralizing agents suspended in water are used in unsaturated flue gas conditions. The temperature at the outlet of the boiler is set at 160°C – 180°C to achieve maximum energy recovery. However, for semi-wet cleaning which relies on the injection and evaporation of water to provide cooling of flue gases, this temperature is not high enough to drive evaporation and cooling to the operating temperature of the flue gas cleaning system (145°C). The amount of water needed to suspend the lime for acid gas treatment is larger than the amount of water that can be evaporated to cool the flue gas to 145°C. Hence not enough lime could be injected to treat the acid gases as required while also achieving the cooling effect. The flue gas temperature would need to be higher to close out this water balance.

Dry flue gas cleaning was considered. In dry flue gas systems, neutralizing agents in dry form are used in unsaturated flue gas conditions. Similar to semi-dry flue gas cleaning, dry systems favour more heat recovery.

It is proposed to use a semi-dry system followed by a bag filter for the treatment of the flue gases to give better energy recovery and an effluent-free process. Again, this option is considered BAT.

3.6.5 Removal of Dioxins, Trace Organics and Heavy Metals

Options for dioxin removal are the injection of a premix of activated carbon or activated clay and lime before the bag house filter. Activated clay is a blend of treated clay and activated carbon. The treated clay is an alternative to activated carbon for dioxin adsorption. Some activated carbon however is still needed for the adsorption of mercury. Activated clay is in this context understood as a blend of ca 90% clay and 10% activated carbon.

Activated carbon or activated clay injection before the bag house filter is an efficient dioxin removal system and is considered BAT. Expanded clay can also be injected for dioxin control before the bag house filter. It is the most favourable option due to its operational simplicity and the fact that a bag house filter has also been proposed for dust removal from the proposed facility.

Alternatively activated carbon or activated clay can be injected as a premixed blend with hydrated lime. However, it is not possible to alter the activated carbon or activated clay /lime ratio when they are dosed together. As the lime need is variable in function of the pollutants in the waste and the dioxin sorbent dosing is a fixed amount separate injection of lime and dioxin sorbent is preferred.

An SCR system is another alternative option. An additional catalyst bed and higher catalyst operating temperature would be required and the risk of catalyst fouling is too high to consider it as an alternative in the earlier stages of the flue gas cleaning system.

It is proposed that a fixed amount of activated carbon or a carbon/clay mixture will be injected in two places. The first will be into the flue gases in the cooling stage and the second into the flue gas either in the dry reactor or just after it. Again, this option is considered BAT.

3.7 Conclusion

3.7.1 Site Selection

The Eastern and Midlands region has the capacity to treat residual municipal solid waste and some pre-treated commercial waste. Indeed, section 16.4.5 of the SRWMP (Page 187) notes that:

> *"the spatial distribution of facilities nationally is potentially unbalanced, with all active and pending facilities located in one region. Despite the strong road network linking regional urban centres to the capital, there is a need to consider the spatial distribution of thermal recovery capacity in the State when authorising future facilities".*

Within the Southern region, the largest population centre is Cork City, which means this is the area where the largest concentration of residual MSW is produced. In addition to this, Cork is a hub for the pharmaceutical industry. Little Island and Ringaskiddy itself are home to a cluster of multinational

pharmaceutical companies, the producers of the hazardous and non-hazardous industrial waste streams which the proposed waste-to-energy facility would treat. Following on from this, the proximity principle underpins the choice of a site in Ringaskiddy, as it is located near the sources of household, industrial, and commercial, hazardous and non-hazardous wastes which the proposed facility would treat.

The review of the original site selection process, and of changes in the Ringaskiddy area since 2000, concluded that the site of the proposed development remains suitable for the waste-to energy facility encompassed in the Ringaskiddy Resource Recovery Centre proposals. A number of developments have taken place and several more are planned in Ringaskiddy. Ringaskiddy retains its industrial nature with the expansion or alteration to existing industrial facilities.

3.7.2 Alternative Thermal Treatment Technologies

The Irish market for waste disposal is relatively small by international standards and is also varied in its composition. Because of this, Indaver believed that the design of the waste-to-energy facility, and of the technology to be chosen, must be sustainable by being robust and flexible enough to be able to adapt to changing waste streams and market conditions that may arise in the future.

The significant lack of large scale and proven examples of alternative technologies remain. Therefore Indaver believes that grate technology is the most appropriate for the range of materials to be accepted for recovery. Grate furnaces provide for the safe and efficient thermal treatment of wastes that are not suitable for reuse or recycling, while allowing flexibility in handling a wide range of waste types and in responding to changes in market conditions and waste streams generated in the future.

The facility is being maximised economically and technology wise in line with policy and environmental benefits to treat household, commercial, industrial, hazardous and non-hazardous waste.

3.8 References

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