

6 Population and Human Health

6.1 Introduction

This chapter addresses potential likely significant effects of the proposed Ringaskiddy Resource Recovery Centre on population and human health.

The proposed development will consist principally of a waste-to-energy facility (waste incinerator) for the treatment of up to 240,000 tonnes per annum of residual household, commercial and industrial non-hazardous and hazardous waste and the recovery of energy. Of the 240,000 tonnes of waste, up to 24,000 tonnes per annum of suitable hazardous waste will be treated at the facility.

In addition to the provision of the waste-to-energy facility, the proposed development will include an upgrade of a section of the L2545 road, a connection to the national electrical grid, an increase in ground levels in part of the site, coastal protection measures above the foreshore on Gobby Beach and an amenity walkway to the Ringaskiddy Martello Tower.

Population and Human Health, as outlined in EPA Guidance on what is to be contained in an EIAR, is a broad ranging topic which “covers the existence, activities and health of people, usually considering people as groups or ‘populations’”

The proposed development has the potential to impact upon population and human health in several ways. Aspects examined in this chapter primarily relate to effects from the proposed development on socio-economic activities and on local community health. The potential effects on population and human health arising from traffic, visual effects, natural amenity, nuisance, built and natural heritage, air and noise emissions, climate change etc, are dealt with in the specific chapters in this EIAR dedicated to those topics (see below):

- **Chapter 5, *Construction Activities*;**
- **Chapter 7, *Roads and Traffic*;**
- **Chapter 8, *Air Quality*;**
- **Chapter 9, *Climate*;**
- **Chapter 10, *Noise and Vibration*;**
- **Chapter 11, *Landscape and Visual*;**
- **Chapter 12, *Biodiversity*;**
- **Chapter 13, *Soils, Geology, Hydrogeology, Hydrology and Coastal Recession*;**
- **Chapter 14, *Archaeological, Architectural and Cultural Heritage*;**
- **Chapter 15, *Material Assets*;**
- **Chapter 16, *Major Accidents and Disasters*.**

Human health effects are primarily considered through an assessment of the environmental pathways by which health can be affected such as air, noise, water or soil. Therefore, the health assessment relies on the assessments in the relevant chapters listed above and draws on the findings as necessary to examine whether the effects arising from any identified impacts may have a health impact and to ensure that the effects which may have a health impact are fully considered:

However, the health assessment also considers health improvement and improvement to services. Other aspects, such as changes in traffic flows which are dealt with in **Chapter 7, Roads and Traffic** have also been considered in this chapter in relation to the assessment of Socio-economic and Health impacts to ensure that the effects of these issues on population and human health have been addressed.

6.2 Assessment Methodology

6.2.1 Introduction

Aspects examined in this chapter primarily relate to effects from the proposed development on socio-economic activities and on local community health. These two themes are discussed in some sections of this chapter but separately in other sections where appropriate.

6.2.2 Guidance

This chapter has been prepared having regard to the following guidelines:

- Department of Housing, Planning and Local Government (2018) Guidelines for Planning Authorities and an Bord Pleanála on carrying out Environmental Impact Assessment, (August 2018);
- EPA (2017) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, draft August 2017);
- EPA (2015) Revised Guidelines on the Information to be Contained in Environmental Impact Statements (Environmental Protection Agency, draft September 2015);
- EPA (2015) Advice Notes for Preparing Environmental Impact Statements (Draft September 2015);
- EPA (2002) Guidelines on the Information to be contained in Environmental Impact Statements;
- EPA (2003) Advice Notes on Current Practice in the Preparation of Environmental Impact Statements;
- US EPA (2016) Health Impact Assessment Resource and Tool Compilation;
- European Commission Guidance (2003) Implementation of Directive 2001/42 on the assessment of the effects of certain plans and programmes on the environment;

- European Commission (2017) Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report;
- Fáilte Ireland (2011) Guidelines for treatment of tourism in an Environmental Impact Statement;
- IEMA (2017) Health in Environmental Impact Assessment - A Primer for a Proportionate Approach;
- IPI (2009) Health Impact Assessment (Institute of Public Health Ireland 2009);
- World Health Organisation (WHO) (2018) Environmental Noise Guidelines for the European Region 2018;
- WHO (2009) Night time Noise Guidelines for Europe;
- WHO (2005) WHO Air Quality Guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide;
- WHO (1999) Guidelines for Community Noise;
- WHO (2014) Regional Office for Europe. Health in impact assessments: opportunities not to be missed.
- WHO (2016) Dioxins and their effects on Human Health WHO Fact sheet No. 225.

6.2.3 Consultation

During the preparation of the previous 2016 EIS, consultations were held with a number of parties in order to ensure that environmental issues, including socio-economic, recreational and amenity issues relating to the project were addressed. The parties consulted are listed in **Appendix 1.2** of **Chapter 1 Introduction** of this EIAR.

Impacts on health were addressed as part of the following assessments and are summarised in this chapter:

- Hazard Identification and Risk Assessment Study (Refer to **Appendix 6.1**);
- Soil dioxin and dibenzofuran (PCDD/F) monitoring programme (Refer to **Appendix 6.2**);
- Modelling of PCDD/F Intake for the proposed development (Refer to **Appendix 6.3**).

6.2.4 Impact Assessment Methodology – Population (Socio-economics)

The appraisal of likely significant effects of the proposed development on socio economics is a qualitative assessment and was conducted by reviewing the current socio-economic environment in the areas close to the proposed development. This included a review of data in relation to demographics, heritage, amenities, community, economic activity, tourism and employment.

In general, the demographic data quoted throughout this chapter is from the most recent Census (2016). Data from the Labour Force Survey (formerly the National Quarterly Household Survey) has also been used.

It is noted that in January 2019, legislation was passed which finalised the revision of Local Government boundary arrangements in Cork. This means that from 31 May 2019, the transition areas of Ballincollig, Blarney, Tower, Glanmire, Douglas Donnybrook, Grange, Frankfield, Rochestown and Togher became part of the Cork City rather than Cork county. Refer to the Cork County Council website for further details.

The boundaries of some local electoral areas have also changed. Detailed census data for the new reconfigured boundaries is not yet available therefore the 2016 census data is relied upon in this chapter.

Information was also sourced from the following sources:

- Cork Development Plan 2014;
- Ballincollig-Carrigaline Municipal District Local Area Plan 2017;
- Central Statistics Office (CSO) (www.cso.ie);
- The Department of Education and Skills (www.education.ie).

6.2.5 Impact Assessment Methodology – Human Health

6.2.5.1 Impact Assessment Methodology - Guidance

The recitals to the 1985 (85/337/EEC) and 2011 (2011/92/EU) EIA Directives refer to “*human health*” and include “*Human Beings*” as the corresponding environmental factor. The 2014 EIA Directive (2014/52/EU) changes this factor to “*Population and Human Health*”. However, no specific guidance on the meaning of the term Human Health has been issued in the context of Directive 2014/52/EU.

In addition, no specific guidance on the assessment of human health in the context of EIA has been issued to date.

The 2017 draft EPA guidelines on the information to be contained in Environmental Impact Assessment Reports (Section 3.3.6) note that “*while no specific guidance on the meaning of the term Human Health has been issued in the context of Directive 2014/52/EU, the same term was used in the SEA Directive (2001/42/EC)*”. The Commission’s SEA Implementation Guidance (Section 5.26) states “*The notion of human health should be considered in the context of the other issues mentioned in paragraph (f) and thus environmentally related health issues such as exposure to traffic noise or air pollutants are obvious aspects to study*”. (Paragraph (f) (of Annex I of the SEA Directive) lists the environmental factors including soils, water, landscape, air etc.).

The 2017 draft EPA guidelines note that the above health assessment approach is consistent with the approach set out in the 2002 EPA Guidelines where health was considered through assessment of the environmental pathways through which it could be affected, such as air, water or soil:

“The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment”.

The 2017 draft EPA guidelines also note under **Section 3.3.6** that in an EIAR, *“the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc. and that “assessment of other health & safety issues are carried out under other EU Directives, as relevant. These may include reports prepared under the Integrated Pollution Prevention and Control, Industrial Emissions, Waste Framework, Landfill, Strategic Environmental Assessment, Seveso III, Floods or Nuclear Safety Directives. In keeping with the requirement of the amended Directive, an EIAR should take account of the results of such assessments without duplicating them”.*

These principles are again supported in Guidelines for Planning Authorities and an Bord Pleanála on carrying out Environmental Impact Assessment, August 2018 issued by the Department of Housing, Planning and Local Government (reference page 28):

“consideration of human health effects resulting from the construction and operation of a project should focus on health issues arising in the context of the other environmental factors listed in Article 3 of the Directive/ Section 171A of the Act, namely:

- *Population;*
- *Biodiversity, with particular attention to protected species and habitats;*
- *Land, soil, water, air and climate;*
- *Material assets, cultural heritage and the landscape;*
- *Interaction between the above factors”.*

Section 1.3.1 (page 37_ of the European Commission guidance (2017) relating to the preparation of the EIAR in reference to “human health” states:

“Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population”.

The Institute of Environmental Management and Assessment (IEMA) is the largest professional body for environmental practitioners in the United Kingdom and worldwide, with nearly 15,000 members. As such it is an authoritative body on Environmental matters. IEMA issued a discussion document in 2017 *Health in Environmental Impact Assessment - A Primer for a Proportionate Approach* which it describes as a primer for discussion on what a proportionate assessment of the impacts on health should be in EIA and is a useful document when considering what can and should be assessed in the context of this EIAR. Due regard has been had to the general approach advocated in this document when undertaking this assessment.

One of the messages in the IEMA document in terms of assessing health in EIA, is that there should be a greater emphasis on health outcomes, (that is the potential effects on human health), rather than simply the health determinants, (that is the agents or emissions which could have the potential to have health effects). The IEMA document noted that in EIA, there has previously been a strong focus on just the agents or emission levels (e.g. dust) rather than focusing on the effects of these agents/emission levels on human health. This change in emphasis does not mean a complete change in practice. For example, measurement and modelling of dust levels continues to be an essential part of the health assessment.

The IEMA document notes that:

“Public health is defined as the science and art of promoting and protecting health and well-being, preventing ill-health and prolonging life through the organised efforts of society and has three domains of practice: health protection, health improvement and improving services”.

The IEMA document suggests that these three domains should be considered in the assessment of human health in EIA. Examples of health protection issues to be considered could include issues such as chemicals, radiation, health hazards, emergency response and infectious diseases whilst health improvement issues could include lifestyles, inequalities, housing, community and employment. Examples of improving services issues could include service planning, equity and efficiencies. This correlates well with Directive 2014/52/EU.

The World Health Organization (WHO) defined health in its broader sense in its 1948 constitution as *“a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”*. Therefore, whilst the EPA guidance is useful in terms of health protection, for a more holistic assessment as per the IEMA document, it is also worthwhile to look at broader health effects in terms of opportunities for improvement of health and for improvement of access to services. While it is important to do this, it is also important not to attribute every conceivable event as being a health effect. To further rely on the WHO definition, a health effect would be something that would have a material impact on somebody’s physical mental and social well-being be that positive or negative.

Therefore, health protection, health improvement and improving services are all considered in this assessment of human health effects. The methodology for assessing health protection is considered further below.

Health Impact Assessment and Environmental Impact Assessment

The IEMA document notes that Health Impact Assessment (HIA) and EIA are separate processes and that whilst a HIA can inform EIA practice in relation to human health, a HIA alone will not necessarily meet the requirements of the EIA Directive in relation to human health. Further, HIA is not routinely carried out for major infrastructure schemes in Ireland, such as this proposed development, and it is typically a non-statutory document that is normally prepared on a voluntary basis by developers overseas, e.g. in the UK.

Guidance for performing HIAs was issued by the Institute of Public Health in Ireland in 2009 and they have outlined that there are considerable difficulties in performing a HIA for a project of this nature. Not least of these is the difficulty of getting baseline health data as it is quite difficult (due to patient confidentiality and other reasons) to accurately determine levels of even relatively common medical conditions in a relatively defined population that might be affected. Qualitative and quantitative baseline health data is a vitally important part of the HIA process. This is because it is first important to determine the baseline health status of the community before it is possible to determine the quantitative impact that a proposal might have on health.

In the absence of accurate baseline data, it is very difficult to assess qualitative and quantitative changes that might occur as a result of a project of this nature.

More useful generalised data that might exist for larger areas (such as a city or county) may be used (as discussed in **Section 6.3.7** below), but these datasets would be at most an estimate of the local baseline and not accurate enough to allow for meaningful interpretation specific to the proposed development. Possible local effects, perhaps due to socioeconomic variations or for other reasons would not be evident using data for larger population areas making the process inaccurate. This difficulty is not unique to the project.

The IEMA document (IEMA, 2017), notes that the WHO provides an overview of health in different types of impact assessment (WHO, 2014) and presents the WHO perspective on the relationship of HIA to other types of impact assessment as follows:

“The health sector, by crafting and promoting HIA, can be regarded as contributing to fragmentation among impact assessments. Given the value of impact assessments from a societal perspective, this is a risk not to be taken lightly ... The need ... and justification for separate HIA cannot automatically be derived from the universally accepted significance of health; rather, it should be demonstrated whether and how HIA offers a comparative advantage in terms of societal benefits ...

Health issues can, and need to, be included [in impact assessment] irrespective of levels of integration. At the same time, from a civic society perspective, it would be unacceptable for HIA to weaken other impact assessments. A prudent attitude suggests optimizing the coverage of health along all three avenues:

- *better consideration of health in existing impact assessments other than HIA;*
- *dedicated HIA; and*
- *integrated forms of impact assessment.”*

It is clear therefore that the WHO does not support a stand-alone HIA unless it can be demonstrated to be of advantage over the assessment of population and human health in the EIAR. In this case no such advantage exists and indeed given the lack of baseline data, a stand-alone HIA would add very little to the assessment process. It is for these reasons that this assessment of human health is part of this EIAR and that no stand-alone HIA has been prepared for the proposed development.

It is therefore important to note that this assessment on human health is provided as part of the overall EIAR rather than a stand-alone HIA. The HIA is defined as a combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a policy, plan, programme or project on both the health of a population and the distribution of those effects within the population.

In contrast, the assessment of human health in the context of EIAR focuses the attention of the assessment on likely significant effects, i.e. on effects that are deemed likely to occur and, if they were to occur, would be expected to be significant (as per the requirements of Directive 2014/52/EU. Conducting a HIA will not necessarily meet the population and human health requirements of the EIA Directive.

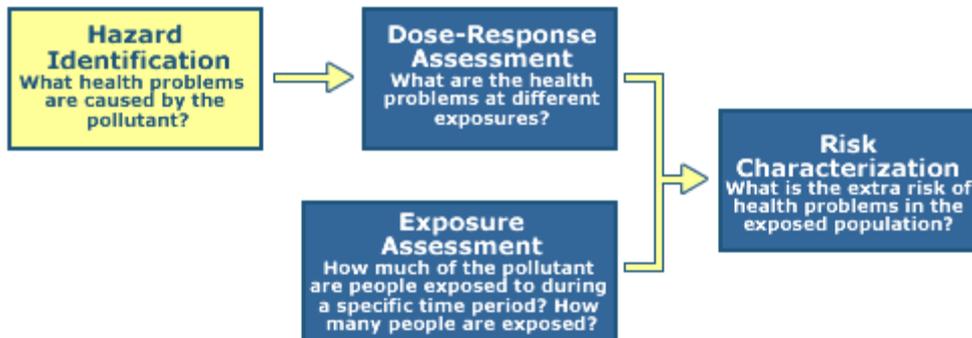
Therefore, *health protection, health improvement and improving services* are all considered in this assessment. The methodology for assessing health protection and health is considered further in **Sections 6.2.5.2** and **6.2.5.3** respectively of this EIAR.

6.2.5.2 Health Protection

The assessment of human health for the proposed development, in terms of health protection, follows the approach set out in the EPA guidelines and in the European Commission's SEA Implementation Guidance. That is the assessment on potential effects on human health is guided using health-based standards. It is also similar in nature to the US EPA guidance. Human Health protection is considered through the assessment of the environmental factors (pathways) through which health could be affected such as air, noise, water and soils. The US EPA guidance includes a four-step approach which is represented graphically in **Plate 6.1** below.

Plate 6.1 Human Risk Assessment. Source US EPA.

The 4 Step Risk Assessment Process



The potential noise, air, soils and water impacts which could affect human health were identified (Hazard Identification), the scale of these potential impacts (Dose-Response Assessment) and their duration (Exposure Assessment) were assessed and the significance of the potential impact on human health determined (Risk Characterisation).

When using a recognised Health Based Standard such as the one issued by the WHO 2009, the dose-response assessment is actually included in the standard.

In other words, the authorities or expert committees which recommended a specific threshold or parameter (i.e. a limit value) in a standard will have inherently taken into account of the health problems at the different exposure levels and thus set the limit value within the standard to prevent these health problems (i.e. significant effects on human health) from occurring.

6.2.5.3 Health Improvement

Projects that have the potential to generate environmental benefits, protect the population from public health dangers as well as support regeneration, reduce unemployment and improve socio-economic circumstance, could contribute to improving the health and wellbeing of communities.

The assessment for the proposed development, in terms of health improvement, includes an assessment of the likely significant effects of the proposed development on the socio-economics of the community.

6.2.5.4 Psychological Impacts

In the planning process, potential adverse effects on psychological health are often mentioned, for example, anxiety and stress experienced by those are worried that there will experience a change in the environment in which they live.

The community will experience annoyance from the temporary effects of the construction phase. This is probably the same as for any construction project and will be relatively limited given the location of the site. Annoyance however, is not in itself a health effect.

For virtually every proposal for any development there are concerns about potential adverse effects on a person's overall psychological well-being. This is somewhat a more difficult matter to assess as there are no direct measurements one can use. While one can give great detail in predicting for example noise emissions one cannot use the same scientific certainty in predicting psychological impacts. It is not possible to use a standards-based approach for example.

There are various degrees of psychological impact and these can be both positive and negative. There can be a positive impact, whereby people may look forward to employment opportunities both direct, as in those who will be employed in construction and operation of the facility, and indirect those whose jobs in for example pharmaceutical and chemical companies may be more secure with a solution to ongoing waste issues.

There can also be adverse effects of varying degrees. At the lower end of this impact might be annoyance where somebody is annoyed by for example, outside noise, dust depositing with construction of the roads. This is not a medical impact as such. If someone develops a psychological illness such as anxiety or depression this would be a medical impact.

There is also the very real concern that people may be worried they will get cancer largely due to misinformation.

The potential effects are minimised or mitigated by education of the reality and provision of regular information on the facts. However, there is no documented evidence from these projects to link adverse outcomes with psychological health in Ireland. There is for example no evidence of an increase in psychological illness around incinerators. This would suggest that despite people holding genuine concerns prior to the facility being built that once operational and people can see the absence of effects, then any such worries dissipate.

6.2.6 Standards

6.2.6.1 Air Quality - Appropriate Standards

The starting point in selecting the appropriate standard to apply is Directive 2008/50/EC of the European Parliament and of the Council, as amended by Commission Directive (EU) 2015/1480 on ambient air quality and cleaner air for Europe (CAFE Directive). In Ireland, air quality is monitored by the EPA to ensure that the relevant limit values specified by EU directives (that set out the targets for specific air pollutants) are achieved. Limit values have been specified in the CAFE Directive for the following air pollutants (as described in detail in **Table 6.1**:

- Sulphur dioxide (SO₂), nitrogen dioxide (NO₂) and oxides of nitrogen (NO_x), particulate matter (PM₁₀ and PM_{2.5}) and lead;
- Carbon monoxide and benzene;
- Ozone; and
- Arsenic, Cadmium, Nickel and Benzo(a)pyrene.

Table 6.1 Limit values as set out in the CAFE Directive

Pollutant	Limit Value Objective	Averaging Period	Limit Value $\mu\text{g}/\text{m}^3$	Limit Value ppb	Basis of Application of the Limit Value	Limit Value Attainment Date
SO ₂	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1 Jan 2005
SO ₂	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1 Jan 2005
NO ₂	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1 Jan 2010
NO ₂	Protection of human health	calendar year	40	21	Annual mean	1 Jan 2010
PM ₁₀	Protection of human health	24 hours	50		Not to be exceeded more than 35 times in a calendar year	1 Jan 2005
PM ₁₀	Protection of human health	calendar year	40		Annual mean	1 Jan 2005
PM _{2.5} - Stage 1	Protection of human health	calendar year	25		Annual mean	1 Jan 2015
PM _{2.5} - Stage 2	Protection of human health	calendar year	20		Annual mean	1 Jan 2020
Lead	Protection of human health	calendar year	0.5		Annual mean	1 Jan 2005
Carbon Monoxide	Protection of human health	8 hours	10,000	8620	Not to be exceeded	1 Jan 2005
Benzene	Protection of human health	calendar year	5	1.5	Annual mean	1 Jan 2010

Additionally, it should be noted that provisions were also made for the inclusion of new ambient limit values relating to PM_{2.5}. These are clearly appropriate and robust standards.

Air quality standards protect the vulnerable including those with respiratory illnesses, the old, very young and infirm. Whilst slightly higher levels of oxides of nitrogen above the limit values may have no effect on the vast majority of the population, elevated levels of pollutants in ambient air may be significant for these vulnerable groups within the population. This assessment has relied on compliance with the limit values in the CAFE Directive to determine likely significant effects on human health. Therefore, adherence to these limit values is considered to represent that there will be no adverse effect on human health due to air quality emissions as **Table 6.1** outlines that the levels set primarily for the protection of human health.

6.2.6.2 Noise - Appropriate Standards

As set out in **Chapter 10 Noise and Vibration**, there is no specific legislation which sets out environmental noise limits that must be achieved.

The noise assessment criteria are based on the Guidelines set out by regulatory bodies such as the EPA, the WHO. It also includes well established standards such as BS 5228 *Code of Practice for the Control of Noise and Vibration on Construction and Open Sites*. Part 1 – Noise and Part 2 – Vibration (2009 +A1 2014).

Construction Noise Criteria

Construction noise is temporary in nature and usually experienced over a short to medium-term period. This characteristic requires it to be considered differently to other longer-term sources of noise. Construction activities on larger-scale developments of this nature will inevitably result in noise being generated temporarily.

There is no Irish guidance specifically published for the short to medium-term construction work such as that required for the proposed development. There are in fact very few residences in the immediate vicinity

Operational Noise Criteria

In relation to human health specifically, for the operational phase the most applicable guidelines are those issued by the WHO. There are new Guidelines in relation to Environmental Noise issued in October 2018 (WHO, Environmental Noise Guidelines for the European Region, 2018). These deal with specific sources of noise such as Roads, Rail, Aircraft and Wind Turbines. They do not specifically deal with construction noise or industrial noise. They supersede and supplement previous Guidelines issues by the WHO including the Community Noise Guidelines 1999 (WHO, WHO (1999) Guidelines for Community Noise, 1999) in relation to community effects of noise and subsequent guidance on Night Time noise in Europe 2009.

In their recent guidance (WHO, Environmental Noise Guidelines for the European Region, 2018), the WHO state that large proportions of the European population are exposed to noise levels in excess of 55dB L_{night}.

The WHO guidelines identify some health effects at quite low night time levels and proposed a population Guidance, for roads, of 45dB L_{night} outside residential properties.

The operational noise criteria set for the project is based on guidance contained within the EPA's *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities* (NG4, EPA 2016). Following a review of the prevailing background noise levels, an operational noise level of 55dB $L_{\text{Aeq,T}}$ for daytime periods and 45dB $L_{\text{Aeq,T}}$ for night-time periods has been set at noise sensitive locations (i.e. residential dwellings and The National Maritime College of Ireland (NMCI)). Refer to **Section 10.5.3.2 of Chapter 10 Noise and Vibration**.

6.2.7 Literature Review

6.2.7.1 Introduction

The introduction of waste incinerators has resulted in numerous studies of the effects of this process on human health. These have been carried out in either the occupational or community setting. Most of the published studies have looked at incinerators whose emissions of dioxins, particulates and heavy metal were far greater than would be emitted by a modern incinerator such as that proposed for Ringaskiddy. Basic scientific principles indicate that the more controlled the emissions are, the lower the level of toxins which are emitted, the less potential for any health effects.

Therefore, the studies that are available, which will be discussed in more detail in the following literature review section, in many ways show a “worse than worst” case scenario for modern incinerators.

They can nevertheless be valuable in making an assessment of the possible human health effects, as if there is little discernible effect with poor controls, therefore we can be scientifically certain there will be still fewer with greater controls.

The health outcomes that have been examined in the various published studies include respiratory symptoms and illness, reproductive effects and the development of cancer. In addition to studies of the possible consequences of non-specific exposure to emissions from waste incinerators, research has also been conducted to determine the presence or effects of exposure to certain substances known to be present in incinerator emissions. In recent years, more attention has also been given to particulate matter such as PM_{10} and $PM_{2.5}$

Previously, reliance has been on the publication from 2003 by the Health Research Board on Health and Environmental Effects of Landfilling and Incineration of Waste and the publication, A review of the environmental and Health effects of Waste Management published in May 2004 by the UK Department of the Environment, Food and Rural Affairs (DEFRA).

Both of these are now somewhat dated. The studies quoted were largely related to older generation incinerators and prior to EU Directives which set limits on emissions but can be assessed in addition to more recent publications.

A PubMed electronic search was also performed on the 13th June 2019 using the key word “incineration” to identify further studies and any more recently published studies. A total of 6,005 articles were identified. When the search was narrowed using the two words “incineration health” 1,278 articles were identified. This could be further reduced if the terms were “waste incineration health” which identified 905. These are all of varying age and relevance.

Using other terms such as incinerator tended to narrow the search further but perhaps might omit relevant articles. A Google search on the same day revealed over 39 million hits for the term “incineration”.

Even narrowing this by using “waste incineration health” over 7,000,000 were found but of course the tool used by the Medical profession is normally PubMed.

It is possible to refine searches in PubMed using a “review” filter and when this was done with the terms “waste incineration health” there were a total of 89 articles. This identifies the articles published in peer reviewed medical journals which attempted to review the available scientific information from other publications.

The aforementioned Health Research Board (HRB) report was commissioned in 2003 to review existing data on waste management methods at that time. It presented the available data at that time. In general, it did not make recommendations on the best solutions and in some ways, this is disappointing but that was not its remit. Regarding the human health effects of incineration, it stated: -

“There is some evidence that incinerator emissions may be associated with respiratory morbidity. Acute and chronic respiratory symptoms are associated with incinerator emissions.

A number of well-designed studies have reported associations between developing certain cancers and living close to incinerator sites. Specific cancers identified include primary liver cancer, laryngeal cancer, soft-tissue sarcoma and lung cancer. It is hard to separate the influences of other sources of pollutants, and other causes of cancer and, as a result, the evidence for a link between cancer and proximity to an incinerator is not conclusive.

Further research, using reliable estimates of exposure, over long periods of time, is required to determine whether living near landfill sites or incinerators increases the risk of developing cancer.

Studies of specific environmental agents and specific cancers may prove more definitive in the future.”

The current status of this statement and its implications for facilities such as Ringaskiddy will be explored in more detail in this assessment.

The DEFRA report although covering many of the same studies went further in terms of scientific interpretation and in those terms was probably more helpful in an assessment of the risks or otherwise associated with a technology such as incineration. For example, it said:

“We looked in detail at studies of incineration facilities and found no consistent or convincing evidence of a link between cancer and incineration. There is little evidence that emissions from incinerators make respiratory problems worse. In most cases the incinerator contributes only a small proportion to local levels of pollutants.”

Since the DEFRA report several important reviews were made. Some of the more important are summarized here.

6.2.7.2 WHO Workshop

The World Health Organisation (WHO) published *Population health and waste management: scientific data and policy options. Report of a WHO workshop. Rome, Italy*, in March 2007. Published 2008. It states:

“Evidence is inadequate to draw conclusions that can be used to determine optimal policy choice on incineration: relatively few good quality studies exist, and they refer to old generation incineration plants-an important distinction, as stack emissions from modern plants are much reduced compared to old generation plants. The adoption of emission abating technology enforced by European Union EU has resulted in a less likely occurrence of measurable health effects on populations resident in the proximity of newer generation incinerators.”

And

“Studies pointing to an increase in soft tissue sarcomas (STS) and non-Hodgkin’s lymphomas (NHL) support a possible aetiological role of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8 T4CDD). The evidence is inadequate to draw conclusions that can be used to determine optimal policy choices on incineration: relatively few good quality studies exist, and they refer mostly to old generation incineration plants – an important distinction, as stack emissions from modern plants are much reduced compared to old generation plants. The adoption of emission-abating technology, enforced by the European Union (EU), has resulted in a less likely occurrence of measurable health effects on populations resident in the proximity of new generation incinerators.”

6.2.7.3 The Porta Review 2009

The Porta review 2009 *Systematic review of epidemiological studies on health effects associated with management of municipal solid waste Daniela Porta et al Environ Health. 2009 Dec 23;8:60.*

As the title suggests it did concentrate on Municipal Solid Wastes (MSW) sites but did include other studies as well. It reported:

“In most cases the overall evidence was inadequate to establish a relationship between a specific waste process and health effects; the evidence from occupational studies was not sufficient to make an overall assessment. For community studies, at least for some processes, there was limited evidence of a causal relationship and a few studies were selected for a quantitative evaluation. In particular, for populations living within two kilometres of landfills there was limited evidence of congenital anomalies and low birth weight with excess risk of 2 percent and 6 percent, respectively. The excess risk tended to be higher when sites dealing with toxic wastes were considered.”

For populations living within three kilometres of old incinerators, there was limited evidence of an increased risk of cancer, with an estimated excess risk of 3.5 percent. The confidence in the evaluation and in the estimated excess risk tended to be higher for specific cancer forms such as non-Hodgkin's lymphoma and soft tissue sarcoma than for other cancers”.

This is broadly in line with previous reviews. Of course, the most important point is that these findings relate to “old” incinerators, 20 years or older. As pointed out in the EIAR, and indeed in the WHO review quoted above, the proposed facility will have to comply with the strictest EU emission standards and simply cannot be compared to the older generation studied.

6.2.7.4 The Giusti Review 2009

Giusti, L., (2009) A review of waste management practices and their impact on human health, *Waste Management*, 29(8):2227-39:

This study concluded:

“The main conclusion of the overall assessment of the literature is that the evidence of adverse health outcomes for the general population living near landfill sites, incinerators, composting facilities and nuclear installations is usually insufficient and inconclusive.”

This is consistent with the other studies.

6.2.7.5 Forastiere 2011

Forastiere 2011 (Forastiere, 2011) *Health Impact Assessment of Waste Management in three Countries*, *Environmental Health*, 10:53.

Forastiere et al. performed a Health Impact Assessment of the effects of waste management including incineration in three countries, England, Italy and Slovakia. It is somewhat historical as it looked incinerators operating in 2001. It made some assumptions based on populations living within 3 km of incinerators based on assumed increases in environmental levels of particulate matter and NO₂ which do not occur around modern incinerators. Nevertheless, their conclusions were:

“Past exposures from incinerators were likely to cause a sizeable health impact, especially for cancer, in Italy and England. However, the current impacts of landfilling and incineration can be characterized as moderate when compared to other sources of environmental pollution, e.g. traffic or industrial emissions, which have an importance on public health”.

This emphasises the difference between historic and modern facilities.

6.2.7.6 Mattiello 2013

Mattiello 2013 (Mattiello, 2013) Health effects associated with the disposal of solid waste in landfills and incinerators in populations living in surrounding areas: a systematic review, *International Journal of Public Health*, 58(5):725-35.

The Mattiello et al. review concluded:

“It is confirmed that historically incinerators are an important source of pollution and harm for the health of populations living nearby; however, changes in technology are producing more reassuring results”.

6.2.7.7 Sharma 2013

Sharma (Sharma, 2013) *The impact of incinerators on human health and environment*, Reviews on Environmental Health, 28(1):67-72.

One review which is out of step with the others is an Indian article published in 2013. This concentrated on potential options for dealing with health care waste. It stated:

“Incinerators releases a wide variety of pollutants depending on the composition of the waste, which leads to health deterioration and environmental degradation. The significant pollutants emitted are particulate matter, metals, acid gases, oxides of nitrogen, and sulphur, aside from the release of innumerable substances of unknown toxicity. This process of waste incineration poses a significant threat to public health and the environment. The major impact on health is the higher incidence of cancer and respiratory symptoms; other potential effects are congenital abnormalities, hormonal defects, and increase in sex ratio. The effect on the environmental is in the form of global warming, acidification, photochemical ozone or smog formation, eutrophication, and human and animal toxicity”.

It suggested greater use of autoclaves and plasma pyrolysis being a solution for the biological hazards of health care waste. This is simply not consistent with the vast majority of published reviews so should be treated with great caution but also as its emphasis was on health care waste it is much less relevant for a facility such as is proposed.

6.2.7.8 Public Health England

Public Health England is a governmental body in the UK charged with analysing information and making recommendations on issues that may pertain to human health in England. Public Health England made a noteworthy statement in 2015 when Dr Simon Bouffler deputy director of PHE’s Centre for Radiation, Chemical and Environmental Hazards stated (Bouffler, 2015):

“that well run and regulated modern municipal waste incinerators are not a significant risk to public health remains valid, and the study is being carried out to extend the evidence base and to provide further information to the public on this subject”.

Font et al in Atmospheric Environment in a separate article published in July 2015 stated:

“From our analysis we found no evidence of incinerator emissions in ambient metal concentrations around four UK MWIs [municipal waste incinerators]. The six UK MWIs studied contributed little to ambient PM10 [particulate matter] concentrations”.

Public Health England funded a study into the particulate emissions from energy-from-waste plants and was carried out by the Small Area Health Statistics Unit (SAHSU) at Imperial College and the Environmental Research Group at King's College London, looking at data gathered between 2003 and 2010. It stated that that incinerators emit a 'low level' of air pollutants. Details of the study were published in the Environmental Science & Technology Journal in 2017. *Environ. Sci. Technol.* 2017, 51, 13, 7511-7519

It stated:

“Overall this study suggests that PM_{10} exposures related to MWI emissions in Great Britain are extremely low (annual means ranging from 1.00×10^{-5} to $5.53 \times 10^{-2} \mu\text{g m}^{-3}$) especially when compared to annual mean background concentrations (typically ranging between 2.00×10^1 and $5.00 \times 10^1 \mu\text{g m}^{-3}$ in Europe)”.

6.2.7.9 Race Against Waste

The website Race against Waste (raceagainstwaste.com) accessed 15th April 2019 was initially set up by the Department of Environment, Community & Local Government as part of a three-year national communications and awareness campaign on waste management in Ireland. This has a section on Incineration:

“Incineration – The Facts

- *There is a broad spectrum of chemicals emitted from incinerators but even in rural situations the overall contribution is usually less than 1% of existing background levels – including dioxins and furans.*
- *Even if 1 million tonnes of municipal waste were to be incinerated in Ireland this would contribute less than 2% of the dioxins emitted to the air (EPA 2001).*
- *The EPA, FSAI and WHO have all indicated that properly managed well run incinerators do not impact on the environment or on human health.*
- *There are 11 incinerators operating in Ireland. Studies carried out by the Food Safety Authority of Ireland (FSAI) show no increase in dioxins in dairy products produced in the vicinity of the plants.*
- *Levels of dioxins in mothers' breast milk and in dairy products (key indicators) have decreased over the past 20 years despite the increased use of incineration in Europe.*
- *Legislation controlling emissions from incinerators is among the strictest environmental legislation in the world.*
- *Incineration will not compete with recycling as infrastructure like thermal treatment plants and landfill will be sized to take the appropriate non-recyclable percentage of the waste stream.*
- *Old badly managed incinerators are being closed down in Europe where they do not comply with the new standards for monitoring and operating. However, new facilities are being provided in their place. Incineration capacity across Europe is increasing.*

- *Modern incinerators reduce waste to between 6-13% of the original volume. Of this, approximately 5-10% is bottom ash and is inert and only 1-3% of the original volume is fly ash requiring disposal in a special facility.*
- *Uncontrolled burning of waste is one of the biggest threats to the Irish environment today because it involves burning waste at temperature levels which create dioxins. Modern well-managed incinerators burn waste at much higher temperatures at which dioxins are destroyed. For example, a modern municipal incinerator treating 1 million tonnes of waste in controlled conditions, releases just 0.54 grams of dioxins to the atmosphere. A recent EPA report (2001) estimates that 60,000 tonnes of waste burned in the back yard produced 18 grams of dioxins”.*

6.2.7.10 Health Protection Agency UK (HPA,2010)

The Health Protection Agency is another UK Governmental agency who are responsible for making recommendation on the protection of health.

They issued a report in 2010. They said:

“While it is not possible to rule out adverse health effects from modern well-regulated incinerators with complete certainty, any potential damage to health of those living close by is very small if detectable”.

It goes on:

“Since any possible health effects are very small, if detectable, studies of Public Health around modern well managed municipal waste incinerators are not recommended”.

This latter point is important as an agency as when a reputable and independent as the Health Protection Agency says this it is very reassuring. As already stated these studies have proceeded anyway to give further evidence again.

6.2.7.11 SAHSU 2018

SAHSU 2018 (Ghosh, 2018)

The long-awaited UK Small Area Health Statistics Unit (SAHSU) study was published last year. This was funded by Public Health England amongst others was one of the largest studies ever published. Its particular importance is that it studied incinerators operating under modern limits. It was titled *“Foetal growth, stillbirth, infant mortality and other birth outcomes near UK municipal waste incinerators [MWI]; retrospective population-based cohort and case-control study”.*

Indeed, interestingly in the now normal conflict of interest statements on of the 14 authors declared Greenpeace membership and another Friends of the Earth membership. This most robust study was therefore entirely independent from the incineration industry. The study was large enough to be able to detect even small changes if such existed.

The result of the study was:

“Analyses included 1,025,064 births and 18,694 infant deaths. There was no excess risk in relation to any of the outcomes investigated during pregnancy or early life of either mean modelled MWI PM10 or proximity to an MWI”.

The conclusion was:

“This large national study found no evidence for increased risk of a range of birth outcomes, including birth weight, preterm delivery and infant mortality, in relation to either MWI emissions or living near an MWI operating to the current EU waste incinerator regulations in Great Britain. The study should be generalisable to other MWIs operating to similar regulations and with similar waste streams.”

While one might say that this may have been expected given the other studies above, it is the first study that one might say extends to the level of proof that there are no adverse health effects with a modern incinerator.

6.2.7.12 European Council Directives

The Waste Incineration Directive (WID) introduced in 2000 set stringent operating conditions and sets minimum technical requirements for waste incineration and co-incineration. It consolidated new and existing incineration controls into a single piece of European legislation.

The requirements of the Directive were developed to reflect the ability of incineration plants to more cost effectively achieve high standards of emission control in comparison to the 1980s. Previous waste incineration directives only applied to municipal and hazardous waste. WID updated the requirements of the 1989 municipal waste incineration (MWI) directives (89/429/EEC and 89/369/EEC) and, merged them with the 1994 Hazardous Waste Incineration Directive (94/67/EC), consolidated new and existing incineration controls into a single piece of European legislation (2000/76/EC).

This has now been superseded by the Industrial Emissions Directive. The proposed facility will have to abide by the strictest of criteria from the first day of operation. The Directive specifies air emission limits which must not be exceeded. The basis of the emission limits is to prevent, or limit as far as is practicable, negative effects on the environment and the resulting risks to human health.

6.2.7.13 Dioxins

Dioxins and furans will form spontaneously in a combustion process from chlorine atoms, carbon that has not been fully oxidised, and various catalysts in cooling smoke; hence, the process is the same for waste incineration plants, turf fires and tiled stoves alike. Each of the 200 dioxin and furan compounds is of a different degree of toxicity; for that reason, their so-called toxicity units (TUs) are determined and summarized into units of grams per toxicity unit (g TU).

Indeed, the public concern on dioxins was so significant that the Food Safety Authority of Ireland (FSAI) published a report in 2003 (FSAI, 2003) on the potential effect on food if waste incineration of municipal waste was introduced into Ireland. They stated:

“In relation to the introduction of waste incineration in Ireland, as part of a national waste management strategy, the FSAI considers that such incineration facilities, if properly managed, will not contribute to dioxin levels in the food supply to any significant extent and will not affect food quality or safety”.

The WHO issued an update to their fact sheet on dioxins No. 225 which was updated in October 2016 (WHO, Dioxins and their effects on human health, WHO Fact sheet N°225 , 2016).

This stated:

“Proper incineration of contaminated material is the best available method of preventing and controlling exposure to dioxins. It can also destroy PCB-based waste oils. The incineration process requires high temperatures, over 850°C. For the destruction of large amounts of contaminated material, even higher temperatures - 1000°C or more - are required”.

Regarding effects on human health it commented:

“Short-term exposure of humans to high levels of dioxins may result in skin lesions, such as chloracne and patchy darkening of the skin, and altered liver function. Long-term exposure is linked to impairment of the immune system, the developing nervous system, the endocrine system and reproductive functions.

Chronic exposure of animals to dioxins has resulted in several types of cancer. TCDD was evaluated by the WHO’s International Agency for Research on Cancer (IARC) in 1997 and 2012. Based on animal data and on human epidemiology data, TCDD was classified by IARC as a “known human carcinogen”. However, TCDD does not affect genetic material and there is a level of exposure below which cancer risk would be negligible”.

“Due to the omnipresence of dioxins, all people have background exposure and a certain level of dioxins in the body, leading to the so-called body burden. Current normal background exposure is not expected to affect human health on average. However, due to the high toxic potential of this class of compounds, efforts need to be undertaken to reduce current background exposure”.

Much of the attention in debates in the past about the human health effects of incinerators has concentrated on dioxins and furans.

The dioxin emissions from modern incinerators are up to 1,000 times less than 20 years ago. This can be seen from the situation in Germany, one of the countries in Europe that has studied this area most closely and one where environmental concerns are taken very seriously. Whereas in 1990 one third of all dioxin emissions in Germany came from waste incineration plants, for the year 2000 the figure was less than 1%.

It is estimated that in Germany now, for example, chimneys and tiled stoves in private households alone discharge approximately twenty times more dioxins into the environment than all the waste incineration plants together (UN, 1999). This is also evident from the fact that in winter airborne dioxin loads are up to five times higher than in summer when heating systems are out of operation, but the incineration plants are still operating. Nevertheless, this has not stopped some people continuing to imply that incinerators are the only source of dioxins however most dioxins we are exposed to are in our diet.

The major dioxin sources are dairy products, as well as some other foods. One however rarely sees this fact highlighted in the press except perhaps after occasional “scares” such as the 2008 Italian one when high levels of Dioxins were found in some agricultural products around Naples, as reported by Malisch (2017). Interesting this was attributed to illegal landfills not incineration.

In addition, there was in 2008 a recall of Irish pork products in relation to elevated dioxins. This was detected through routine monitoring of food. This was traced to contaminated feed which in turn traced back to contaminated oil. There was no evidence of a public health issue.

Because the food we eat is increasingly not from the immediate vicinity in which we live but rather from the broader national and international sources the effect of any source may be dispersed far and wide but equally we may be more vulnerable to high levels coming from all parts of the world rather than our own “back-yard”.

6.2.7.14 Heavy Metals

Heavy metals, such as lead and mercury, are retained in the filtering devices of waste incineration plants. They are not regarded as carcinogens. Whether or not they are poisonous for human beings will depend on whether they reach their thresholds of effectiveness. In effect, for these to have a human health effect, they must leave the incinerator in the form of emissions and enter the human body either by inhalation or ingestion and theoretically, but rarely in practice, through the skin.

For these substances, too, there has been an impressive decline in emissions from modern incinerators compared with historical measures. Improved controls and reduction in amounts in wastes presenting for treatment explains the marked reduction experience in their emissions.

For example, whereas in 1990, emissions in Germany amounted to as much as 57,900 kilograms (kg) of lead and 347 kg of mercury from the incineration of household waste, the respective levels declined to 130.5 kg (equivalent to 0.2% of initial emissions) and 4.5 kg (1.3% of initial emissions) in the year 2001. Thus, lead and mercury emissions from the incineration of household waste are also no longer significant for human exposure to emissions of toxic substances.

6.2.7.15 Specific Health Issues

Respiratory symptoms and illness

Some older studies, described in the 2003 Health Research Board (HRB) report did show that symptoms of respiratory illness, such as chronic cough, wheeze and sinus trouble, were significantly greater in those living near a hazardous waste incinerator than in their control community. It should be noted that these studies predated much stricter environmental controls on the emissions of particulates to which the proposed Ringaskiddy site would operate.

Studies of self-reported symptoms must always be treated with caution as they can be more revealing about peoples’ concerns rather than actual health effects. Again, while there have been some of these in the past none were without issues.

As any respiratory symptom that might occur must in turn be related to increase in some airborne contaminant, be it particulate matter or products of combustion such as Sulphur Dioxide or Nitrogen Dioxide. It follows that with the vast reduction of the emission of these in newer incinerators, to levels where there is little or no change in the baseline conditions, these effects will not occur. In effect the emissions from modern incinerators will not cause coughs or respiratory symptoms.

Reproductive effects

Very often when one discusses incineration, concerns are expressed about potential reproductive effects.

It is true that in the 1980s studies quoted in the HRB report there were reported to be an increase in the frequency of twinning in human and cattle populations in an area in central Scotland at increased risk from incinerator emissions.

These findings have not been replicated.

The HRB report also mentions a study of open chemical combustion in the Netherlands in the 1960's was carried out to investigate the incidence of orofacial clefts in the region and to determine any association with the local combustion facility. The authors concluded that these results inferred an association between the incinerator and the increased local incidence of orofacial clefts. Although this increase was probably a true finding, the possibility of other influencing factors, such as alternative sources of exposure, could not be ruled out.

This study is of open chemical burning and bears no relation to modern incineration and so is of no relevance to the proposed facility but again is described here as it is often quoted by persons opposing incineration per se.

A review performed by Ashworth et al (Ashworth, 2014) entitled *Waste incineration and adverse birth and neonatal outcomes: a systematic review* was published in 2014 and is probably the most authoritative ever published.

This concluded;

“that a comprehensive literature search yielded fourteen studies, encompassing a range of outcomes (including congenital anomalies, birth weight, twinning, stillbirths, sex ratio and infant death), exposure assessment methods and study designs. For congenital anomalies most studies reported no association with proximity to or emissions from waste incinerators and “all anomalies”, but weak associations for neural tube and heart defects and stronger associations with facial clefts and urinary tract defects. There is limited evidence for an association between incineration and twinning and no evidence of an association with birth weight, stillbirths or sex ratio, but this may reflect the sparsity of studies exploring these outcomes”.

It went on;

“The current evidence-base is inconclusive and often limited by problems of exposure assessment, possible residual confounding, lack of statistical power with variability in study design and outcomes. However, we identified a number of higher quality studies reporting significant positive relationships with broad groups of congenital anomalies, warranting further investigation.

Future studies should address the identified limitations in order to help improve our understanding of any potential adverse birth outcomes associated with incineration, particularly focussing on broad groups of anomalies, to inform risk assessment and waste policy.”

The recently published SASHU study (Ghosh, 2018) confirms no adverse effects with modern incinerators. This studied over 1 million births so is an extremely robust study.

Cancer

It is fair to say some studies have reported putative links between incinerators and cancers. However not one of these studies was without problems. In the past incinerators were often sited in urban, industrial and otherwise polluted areas. This introduced major confounders for studying cancers such as deprived populations, urban living, other sources of industrial pollutions, cigarette smoking habits etc.

It is also true that other studies did not support such a link.

The largest study by Elliot (Elliot, 1996) in 1996 examined 72 No. incinerators. This included essentially all incineration plants, irrespective of age, up to 1987. This was by far the largest and statistically probably the best study ever conducted. It studied a total of 14 million people.

It nevertheless was unable to convincingly demonstrate an excess of cancers in areas within 7.5 km of incinerators once socio-economic confounding was taken into account.

There were reported individual increases for stomach, lung, colorectal and primary liver cancers. This however was thought to be largely due to residual confounding by socio-economic factors. Liver cancer, for example, was the most strongly significant (37% excess risk within 1 km of municipal waste incinerators) but, on review of cancer registration data, this cancer category was reported to be frequently misclassified or misdiagnosed (mainly secondary liver tumours). In a follow up study to they attempted to determine the size of any true excess in the vicinity of municipal waste incinerators. In a sample of cases subjected to histological and medical record reviews, only about half were reported to be true primary liver cancer. This resulted in a re-estimation and significant reduction of the calculated excess risk previously reported.

The strong association between deprivation and primary liver cancer was thought to remain an influence on the residual result.

Nevertheless, the overall finding from this very large study was of no increase in cancers in those living close to incinerators.

As a result of this study but also taking into account studies previously published, the UK Department of Health's Committee on Carcinogenicity (COC) published a statement in March 2000 (COC, 2000), evaluating the evidence linking cancer with proximity to municipal solid waste incinerators in the UK. The Committee specifically examined the results of these studies, and concluded that,

“Any potential risk of cancer due to residency (for periods in excess of ten years) near to municipal solid waste incinerators was exceedingly low and probably not measurable by the most modern techniques”.

The Committee agreed that the observed excess of all cancers, stomach, lung and colorectal cancers was due to socio-economic confounding and was not associated with emissions from incinerators. The Committee agreed that, at that time, there was no need for any further epidemiological investigations of cancer incidence near municipal solid waste incinerators.

Indeed, the DEFRA report published in 2004 and referred to in the introduction of the Literature Review concluded:

“We looked in detail at studies of incineration facilities and found no consistent or convincing evidence of a link between cancer and incineration. There is little evidence that emissions from incinerators make respiratory problems worse. In most cases the incinerator contributes only a small proportion to local levels of pollutants.”

This absence of a measurable effect was evident even with older and undoubtedly dirtier incinerators. When this is true we can be as scientifically certain as we can be that there can be no effect with lower emissions from modern facilities regulated to the highest standards.

6.2.7.16 Repeatedly quoted papers

British Society of Ecological Medicine (2006) The health effects of waste incinerators.

This document was published by the British Society of Ecological Medicine (BSEM) in February 2006. This “Society” appear to have little academic standing and we are addressing the report here not because of scientific merit but rather the fact that it has been quoted in submissions in previous applications by Indaver.

Enviros, now known as SKM Enviros, was the company commissioned by the UK government to produce a literature review on health effects of waste management in 2004 commented on the BSEM report. The Enviros report, ‘Evaluation of the 4th Report of the British Society for Ecological Medicine: “The Health Effects of Waste Incinerators”’ was published in 2006 and makes the following points about the BSEM report (2006):

“The study makes the common mistake of identifying incinerators as a significant source of emissions of fine particulate matter, dioxins and furans, volatile organic compounds and metals. In fact, incinerators do not make a significant contribution to emissions of these substances. This means that, while the report may make valid comments about the risks to health associated with exposure to these substances, the conclusion should be to consider what needs to be done to deal with the main sources of these emissions. For example, emissions of PM₁₀ from MSW incineration are approximately 100 tonnes per year, compared to 22,000 tonnes per year from electricity generation. Emissions of finer particles (e.g. PM_{2.5} and PM₁) and secondary particles would be expected to be in a similar proportion. If it is right to be concerned about fine particulate matter, then attention needs to be paid to controlling emissions from electricity generation, road transport, agriculture and domestic sources. No discernible benefit would be gained by any policy change relating to waste incineration, because the source is simply too small to be significant.”

It concluded:

“The report falls down badly in its understanding of incineration processes. It fails to consider the significance of incineration as a source of the substances of concern. It does not consider the possible significance of the dose of pollutants that could result from incinerators. It does not fairly consider the adverse effects that could be associated with alternatives to incineration. It relies on inaccurate and outdated material. In view of these shortcomings, the report’s conclusions with regard to the health effects of incineration are not reliable.”

The Health Protection Agency in the UK also reviewed the report and stated:

“The BSEM report is not a systematic review of the literature and there is no critical analysis of the quality of the included studies. Consequently, the report presents a selective and inaccurate review of the scientific literature.

For example, the report has not considered important reviews such as the Defra review of environmental and health effects of waste management, the Committee on Carcinogenicity (COC) statement on cancer incidence near municipal solid waste incinerators in Great Britain or the Royal Society critique of the Defra review.

In addition, several statements regarding health risks are not supported by appropriate scientific references, for example ‘...increased ischaemic heart disease has been reported in incinerator workers’ is taken from a study regarding cement kilns ‘They are therefore capable of extremely serious health consequences’.

The authors have also failed to acknowledge the impact of the current legislative changes which minimises the potential for public exposure to emissions. The Waste Incineration Directive for example has strengthened the regulatory regime and provides for strict operating robust monitoring programmes.

There are misleading statements on health issues such as carcinogenicity and it misinterprets the ‘precautionary principle’. The precautionary principle should be invoked if there is good reason to believe that harmful effects may occur and the level of scientific uncertainty regarding the consequences or likelihood of the risk is such, that the best available scientific methods to assess the risk with sufficient confidence is not complete, to inform decision making.

As there is a body of evidence strongly indicating that contemporary waste management practices of modern incinerators have at most, a minor effect on human health and the environment, there are no reasons for adopting the ‘precautionary principle’ to restrict the introduction of new incinerators”.

Again, this has been referred to in the above “British Society of Ecological Medicine” “report” and also in submissions to previous Indaver applications. Again, the Enviro response (2006) is quoted below which adequately deals with this area.

“The BSEM Enviro Response states that “... incinerators will create vast amounts of dioxins, particularly in the ash for periods of 20-30 years...” An incinerator accepting 100,000 tonnes of waste per year over 25 years will result in the production of approximately 25 grams of dioxins and furans in solid residues and approximately 1 gram in emissions to air (expressed as toxic equivalent).

For context, sources such as accidental fires, agricultural waste burning, industrial combustion and small-scale waste burning (e.g. on building sites) all give rise to a thousand times more emissions to air.

Information on emissions in residues is harder to obtain, but landfill of household waste results in the production of more than one hundred times as much dioxin as would be contained in the ash from an incinerator. What can we conclude from this? The BSEM concludes that emissions at this level would constitute “tearing up” the Stockholm treaty. A more appropriate conclusion is that the UK should fulfil its responsibilities under the Stockholm treaty by dealing with sources such as those listed above. Envirois is working with the UK Government in this area.

Preventing further development of waste incineration on these grounds risks diverting attention from much more important sources of unintentional persistent organic pollutants and will make no detectable or significant difference to the unintentional production of dioxins and furans.”

The same comments are equally applicable to Ireland.

6.3 Receiving Environment

6.3.1 Project Location

6.3.1.1 Site Description

The site for the Ringaskiddy Resource Recovery Centre is located approximately 15km to the south-east of Cork City, in the townland of Ringaskiddy on the Ringaskiddy Peninsula in the lower part of Cork Harbour.

The site occupies an area of approximately 13.55 hectares and is located approximately 800m east of the village of Ringaskiddy. The land rises from north to south, and also generally from east to west. The lowest elevation is approximately 2.05-3.0m Ordnance Datum (OD) along the northern boundary with the local road. The highest point is approximately 41.0mOD along the southern site boundary in the vicinity of the Martello Tower, which is in the adjoining field to the south. The site is currently covered in scrub with some pockets of trees and open grass areas. Refer to **Figure 4.1 of Chapter 4 Description of Proposed Development** which shows the existing site layout. There are no buildings or structures on the existing site.

The L2545, the main road from Ringaskiddy village to Haulbowline Island, forms the northern boundary of the site. The eastern boundary of the site extends to the foreshore of Cork Harbour along Gobby Beach. The site surrounds the Hammond Lane Metal Recycling Co Ltd facility. The lands to the immediate south and west are in agricultural use. Refer to **Figures 1.1 and 1.2 of Chapter 1 Introduction** of this EIAR which show the site location. Refer also to **Section 4.2.2 Existing Site Description of Chapter 4 Description of Proposed Development** for further details on site description.

6.3.1.2 Immediate Vicinity

The site encircles the Hammond Lane Metal Recycling Company facility. The facility contains several metal buildings, concrete walls, and some large pieces of machinery. Hammond Lane expanded its facilities in 2015. There is also an ESB Networks compound (Lough Beg substation) located adjacent to the eastern boundary of the Hammond Lane facility. Refer to **Figures 4.1 to 4.6 of Chapter 4 Description of the Proposed Development** of this EIAR.

The L2545 is an extension of the N28 that leads from Ringaskiddy past the proposed development site and over the bridge to the crematorium on Rocky Island and Haulbowline Naval base.

The National Maritime College of Ireland (NMCI), is located opposite the entrance to Hammond Lane and opened in 2004. The UCC ERI Beaufort Building (construction completed in 2015), is located on the site to the east of the National Maritime College of Ireland. MaREI (Centre for Marine and Renewable Energy) and the Lir National Ocean Test Facility are both located in the Beaufort Building refer to **Figures 4.3 to 4.6**.

Some warehouses are located on the northern side of the L2545 road, to the west of the National Maritime College of Ireland.

The land to the immediate south of the Indaver site is owned by IDA Ireland and is used for agriculture. Just beyond the southern boundary, the site is further visually defined by the high voltage electricity line that runs west overhead to connect with the ESB sub-station near Shanbally and east (then north) to Haulbowline Island. Further to the southwest, the land continues to rise slightly to create the ridgeline on which a Martello Tower is located at the highest point (43mOD). South of the Martello Tower, the land has recently been used for the extraction of approximately 134,000m³ of topsoil and subsoil over an area of 9.3 hectares for earthworks as part of the Haulbowline Island remediation project (Planning file No. 166219) which is now complete, refer to **Section 17.6.6 in Chapter 17 Cumulative Effects, Other Effects and Interactions**, for further discussion.

Refer to **Figures 4.3 to 4.6 of Chapter 4 Description of the Proposed Development** of this EIAR.

The land to the west of the site is in agricultural use. Further to the west there is a single, large, white-painted residential property (Ring House) located approximately 50m from the site boundary, set within a field and surrounded by trees.

The eastern section of the M28 Cork to Ringaskiddy Motorway Scheme is proposed to cross the far western part of the Indaver site. Planning consent was granted for the motorway scheme in July 2018 (PL04.HA0053). A judicial review for the scheme is ongoing. The construction phase of the project is estimated to be between 30-36 months however there is no indication as to when construction might commence. Refer to **Figure 4.7 of Chapter 4 Description of the Proposed Development** which shows an indicative location of the proposed M28 Cork to Ringaskiddy Motorway Scheme in the vicinity of the Indaver site.

6.3.1.3 The Wider Area

The centre of Ringaskiddy village is located approximately 800m to the west of the site of the proposed development. The Port of Cork's port facilities are located to the north of Ringaskiddy village.

The Ringaskiddy peninsula is industrial in character, with a number of pharmaceutical companies having large manufacturing facilities in the area, in addition to the Port of Cork facilities. The locations of some of these industries are shown in **Figures 4.3 to 4.6**.

Recent additions to the Ringaskiddy area include a fourth 100m hub-height wind turbine, located at a DePuy site, approximately 1.2km southwest of the site boundary. The nearest wind turbine is located on the other DePuy site approximately 290m south of the Indaver site boundary.

The Cork Harbour area has a mixture of urban developments, such as Cobh, Rushbrooke and Monkstown, and pockets of industry near the shore. Spike Island is located approximately 500m to the east of the site, with the disused Fort Mitchell prison located there and now a popular tourist attraction.

There is an Irish Naval Service base situated on Haulbowline Island (refer to **Figure 4.3**) and a crematorium on Rocky Island. Both islands lie to the north of the site.

6.3.2 Principal Potential Receptors

An appraisal of the principal potential receptors within the environs of the proposed facility including homes, schools and commercial and industrial premises was conducted and is detailed below.

6.3.2.1 Homes

The settlement of Ringaskiddy including Port of Cork is described as follows in the Ballincollig Carrigaline Municipal District Local Area Plan 2017:

3.7.6Ringaskiddy has excellent port facilities and contains predominantly large-scale manufacturing industrial uses that occupy large, stand-alone sites with eight of the Top 10 pharmaceutical companies located in the area"

3.7.7 The settlement consists of two small villages, Shanbally and Ringaskiddy and there are a number of residential and amenity uses that would benefit from protection from the impact of nearby large-scale development. There is, however very limited expansion for residential uses because of the importance of the area for future industrial development"

According to the Ballincollig Carrigaline Municipal District Local Area Plan 2017 above, the "settlement" of Ringaskiddy comprises two small villages, Shanbally and Ringaskiddy village.

In general, the demographic data quoted throughout this chapter is from the most recent Census (2016). Data from the Labour Force Survey (formerly the National Quarterly Household Survey) has also been used. It is noted that in January 2019, legislation was passed which finalised the revision of Local Government boundary arrangements in Cork.

This means that from May 31st, 2019, the transition areas of Ballincollig, Blarney, Tower, Glanmire, Douglas Donnybook, Grange, Frankfield, Rochestown and Togher became part of the Cork city rather than Cork county. Refer to the Cork County Council website¹ for further details.

According to the CSO Small Area Population Statistics (SAPS), the “settlement” of Ringaskiddy village (including Loughbeg) was recorded as having 580 residents in the 2016 CSO Census and a total housing stock of 228.

The Carrigaline Electoral Division (ED) (No: 082) (of which Ringaskiddy forms a part of) had a population of 12,118 in the 2016 CSO Census². Refer to **Figure 6.1** which shows the boundaries of the Carrigaline Electoral Division (ED) (No: 082) and Ringaskiddy settlement. (Refer to **Section 6.3.5** below for further details on population statistics).

The nearest residence (Ring House) is located approximately 50m from the western site boundary and is located approximately 400 metres from the main process building of the Resource Recovery Centre.

No undeveloped land is zoned for residential development in Ringaskiddy, in the LAP.

6.3.2.2 Haulbowline Naval Base

Haulbowline is an island of about 84 acres which is linked by bridge to Ringaskiddy. Haulbowline is State property and is the headquarters of the Irish Navy. The land east of the naval base is called the East Tip and is currently being developed as a public park. The site of the Ispat factory is located between the East Tip and the Naval Base, these lands excluded from the park works, refer to **Section 6.3.3.2** below for further detail.

6.3.2.3 Childcare Providers

There are a number of childcare providers in the Carrigaline and surrounds area including Ferryview Childcare and Daycare, Ringaskiddy which is located at the entrance to the Ferryview housing estate, approximately 650m west of the site³.

6.3.2.4 Health, Social, and Community Facilities

Local area facilities include the Community Centre at Ringaskiddy. Churches located in the study area include those located at Ringaskiddy, Shanbally, Monkstown, Passage West, Carrigaline and Cobh.

¹ <https://www.corkcoco.ie/en/accessibility-maps-publications/cork-boundary-change-information>

² Electoral divisions as per the 2016 CSO Census.

³ Source Cork County Childcare Committee Ltd 2019 www.corkchildcare.ie

6.3.2.5 Schools and Colleges

As discussed previously, the UCC ERI Beaufort Building and the NMCI are located across the L2545 road from the site. Details are provided in **Table 6.2** below on primary and post primary schools located within 10km of the site boundary. The distances calculated are the linear distance from entrance to the main site where the process building will be located to the particular educational facility.

There is one primary school within Ringaskiddy Village – Ringaskiddy Lower Harbour National School which is located within the village. Shanbally National School is situated approximately 1.3km southwest of the site boundary.

Table 6.2 Primary and Post Primary Schools in the Area. Source: Department of Education and Skills (www.education.ie)

School Type	Name	Address	Distance from the Site Boundary
Primary	Ringaskiddy Lower Harbour NS	Ringaskiddy	1.3 km
Primary	Bunscoil Rinn an Chabhlaigh	Cobh	2.2 km
Primary	Cobh National School, Bellevue	Cobh	2.7 km
Post Primary	Coláiste Muire	Cobh	2.7 km
Primary	St Mary's National School	Cobh	2.7 km
Primary	Monkstown NS	Monkstown	2.7 km
Primary	S N Seosamh	Cobh	2.8 km
Post Primary	Cobh Community College	Cobh	2.9 km
Primary	Gaelscoile Cobh	Cobh	2.9 km
Primary	Scoil Chros tSeáin	Crosshaven	3.1 km
Primary	S N Bun an tSabhairne	Crosshaven	3.2 km
Primary	Shanbally National School	Shanbally	3.3 km
Post Primary	Coláiste Muire	Crosshaven	3.4 km
Primary	Templebrady NS	Crosshaven	3.5 km
Post Primary	St. Peter's Community School	Passage West	4.5 km
Primary	Star of the Sea	Passage West	4.5 km
Primary	Whitegate Mixed NS	Whitegate	4.9 km
Primary	Educate Together Carrigaline	Carrigaline	5.2 km
Post-Primary	Gaelscoil Charraig Uí Leighin	Carrigaline	5.7 km
Primary	St. Mary's Church of Ireland NS	Carrigaline	5.7 km
Post Primary	Carrigaline Community School	Carrigaline	5.8 km
Primary	Sonas Special Primary School	Carrigaline	6.1 km
Primary	Walterstown NS	Cobh	6.2 km
Primary	Scoil Mhuire Lourdes	Carrigaline	6.5 km
Primary	St. John's Girls NS	Carrigaline	6.5 km
Primary	St. Mary's National School	Cobh	9.3 km

6.3.3 Heritage and Amenity

6.3.3.1 Heritage

Archaeological, architectural and cultural heritage are discussed in **Chapter 14 *Archaeological, Architectural and Cultural Heritage*** of this EIAR.

In summary, there are no recorded archaeological sites, no cultural heritage sites and no protected structures within the proposed development site. A Martello Tower, listed in the Record of Monuments and Places, (RMP No. CO087-053---) and listed in the Record of Protected Structures (RPS 00575) stands approximately 70m to the south of the proposed development site. Refer to **Chapter 14** for further details.

Ordnance Survey maps show that a path once led north-east through the proposed development site from the Martello Tower to the sea shore at the eastern end of the Ringaskiddy peninsula. Refer to **Chapter 14** for further details. Anecdotal evidence suggests that the site was used as a source of material for land reclamation elsewhere in Ringaskiddy, and that this accounts for the steep escarpment running east-west within the site. Although it is shown on historic maps, much of the path is no longer in existence, most likely due to the removal of soil in the past. There is no legal registered right-of-way along this path.

A farm track runs through waste-to-energy side of the site (east of Hammond Lane) from the L2545 to the southern boundary of the site. Although there is no legal registered right-of-way, the site appears to be used very occasionally as a pedestrian link between the shore and the Martello Tower.

Nature conservation areas are discussed in **Chapter 12 *Biodiversity*** of this EIAR. In summary, there are no environmental designations located within the site of the proposed development. The majority of the site is currently covered in scrub with some pockets of trees and open grass areas. Gobby Beach is located along the eastern boundary of the site. Cork Harbour Special Protection Area (SPA) is located 0.5km to the south of the site. Refer to **Chapter 12** for further details.

Geological Heritage Sites (GHSs) are discussed in **Chapter 13 *Soils, Geology, Hydrogeology, Hydrology and Coastal Recession*** of this EIAR. In summary, there are no Geological Heritage Sites (GHS) located within the site of the proposed development. There are two GHS sites in the general vicinity of the site. These are Golden Rock, located approximately 400m southeast and Lough Beg section, located approximately 1.4km south of the site. Refer to **Chapter 13** for further details.

Scenic routes and designated landscapes are discussed in detail in **Chapter 11 *Landscape and Visual Assessment*** of this EIAR. In summary, there are some scenic routes and scenic landscape designations in close proximity to the site in the (Cork County Development Plan 2014). Refer to **Chapter 11** for further details.

6.3.3.2 Local Amenities

Infrastructure

From a local amenity viewpoint, the N28 road which passes through Ringaskiddy Village is a busy road carrying port and industrial traffic twenty-four hours per day.

It passes eastwards through Ringaskiddy Village as far as the junction with the entrance to the ferry port and the main road to Loughbeg and continues eastwards as the L2545 past the Indaver site as the access road to Hammond Lane, the crematorium at Rocky Island, the National Maritime College of Ireland, the Beaufort Laboratory, the Naval Base on Haulbowline Island and Gobby Beach.

Cork County Council, in association with Transport Infrastructure Ireland (TII) (formerly the NRA), plans to construct a new M28 dual carriageway road from the Bloomfield Interchange near Douglas to Ringaskiddy. This road which is currently in the planning process, will serve the future traffic needs of the area while removing traffic from Shanbally and Ringaskiddy Villages. The eastern section of the M28 Cork to Ringaskiddy Motorway Scheme is proposed to cross the far western part of the Indaver site. Planning consent was granted for the motorway scheme in July 2018 (PL04.HA0053). A judicial review for the scheme is ongoing.

Gobby Beach

The sandy/rocky shore at the eastern end of the peninsula at Ringaskiddy is known as Gobby Beach. This beach is a local amenity served by a small public car park (Gobby Beach car park) and is frequently used by local residents for walking.

Martello Tower

There is a pathway to the Martello Tower from the main Ringaskiddy to Loughbeg Road. As discussed in **Section 6.3.3.1** above, the site appears to be used very occasionally as a pedestrian link between the shore and the Martello Tower.

Fishing

The Deepwater Quay at Ringaskiddy is one of Cork Harbour's premier shore fishing locations. During the winter months, bottom fishing will produce Flatfish, Whiting and Codling. Ray is caught during the summer, while Coalfish and Conger can be caught all year round. Fishing is also carried out from the shore at Gobby Beach.

Parks and Sports Grounds

Local sports clubs include Raffeen Creek Sports Club in Ringaskiddy which comprises Raffeen Creek Golf Club, Raffeen Creek Pitch and Putt Club and two soccer pitches. Shamrocks Hurling and Football Club is located in Shanbally, near Ringaskiddy. The Hibernian Soccer Club is also based in Shanbally.

The Ringaskiddy and District Residents Association received a grant of planning in 2014 for the construction of a community children's playground on a site adjacent to the N28 in Ringaskiddy Village. The playground is now constructed.

As mentioned in **Section 6.3.1**, remediation works are now complete at the East Tip of Haulbowline Island. The East Tip was part of the Former Ispat Steelworks on Haulbowline Island. The Haulbowline Island Recreational Park is due to be opened to the public in 2019.

The park also will also have a football pitch and car park. Haulbowline Island is identified as an East Cork Bird Trail Hotspot. A bird reserve is located at Loughbeg.

6.3.3.3 Amenities in Cork Harbour

There is extensive recreational use of Cork Harbour, mainly the Lower Harbour, for sea angling and boating. Leisure and recreational activities within the Harbour and its immediate surrounds include sailing, rowing, windsurfing, canoeing, angling, bird watching, swimming and walking. Sailing is a popular amenity in Cork Harbour and there are several sailing/yacht clubs in the Harbour including Lower Aghada Tennis and Sailing Club, East Ferry Marina, Cobh Sailing Club, Monkstown Bay Sailing Club and Royal Cork Yacht Club, which is in Crosshaven.

Spike Island is a popular tourist in Cork Harbour as the location of the former prison which closed in 2004 and re-opened in June 2016 as a visitor attraction. It is reported that in 2018 over 70,000 visitors came to the island and Cork County Council has a target of 100,000 visitors by 2020. The island is accessed by ferry from Cobh, north of the island. Spike Island is separated from the Indaver site by a channel (West Channel) which is circa 700m wide.

Meitheal Mara is a maritime cultural organisation based in Cork city. It was founded in 1994 as a community employment Currach building project and frequently uses the harbour for boating activities. Meitheal Mara organises the annual Ocean to City Race for rowing boats and canoes.

Typically, boats use the main shipping channel (known as Cobh Road) which runs north of Haulbowline Island and Spit Bank, and north and east of Spike Island. Leisure craft including sailing and motor boats use the West Channel on occasion but there are depth restrictions due to the shallow nature of the channel and the presence of Curlane Bank to the south and Spit Bank to the north. Depths range from 0.2m to 5.9m (Chart Datum) and the channel is too shallow to be used as a shipping channel. Sailing race courses around the harbour pass in close proximity to Spike Island and there is an annual sailing race around Spike Island.

The race takes place during the summer at a high tide (preferably spring tide) when there is enough depth in the channel for larger boats such as cruisers. Other annual sailing races in the Harbour include Cork Week, which is held every two years.

The Monkstown and Cork Harbour Rowing Club is based in Monkstown. Irish Coastal Rowing Federation Clubs which utilise Cork Harbour include Rushbrooke, Passage West, Commodore, Crosshaven, Blackrock, East Ferry, Cobh Fishermen, Maritime College and Naval Service rowing clubs.

Fota Estate, Fota House and Arboretum, Fota Wildlife Park, Fota Island Hotel and Spa and Fota Golf Club are situated on Fota Island, in the Upper Harbour. Other golf clubs around the Harbour area include Monkstown and Cork Golf Clubs.

Amenities in Passage West and Monkstown include a sea front walk which runs north to Hop Island, and a children's playground which is located in Passage West.

6.3.4 Economic Activity

6.3.4.1 Tourism

In 2011, Fáilte Ireland published Guidelines on the treatment of tourism in an Environmental Impact Statement, noting that there are two interactions between tourism and the environment:

- Impacts caused by tourism projects (e.g. marinas and holiday villages); and
- Impacts affecting tourism (e.g. the quality of a destination or a tourism activity).

The Guidelines note that the assessment of effects on tourism should be treated as a specialist sub-section of the topic 'Population and Human Health', with particular elements being considered, as appropriate within other sections, e.g. Landscape, Flora and Fauna and Cultural Heritage etc. Chapter 3 of the Guidelines list a number of factors – in order of priority are the reasons why tourists visit and enjoy Ireland. These factors have been considered where relevant in various sections of this EIAR as follows in **Table 6.3**:

Table 6.3 Reasons why tourists visit and enjoy Ireland in order of priority (according to the Guidelines). These are addressed in the relevant sections of this EIAR

Factor	EIAR Chapters / Notes
Beautiful scenery	Landscape and Visual (Ch 11) The guidelines note that "there appears to be evidence that the visitors expectation of 'beautiful scenery' does not exclude an admiration of new modern developments – such as windfarms-which appear to be seen as indicative of a modern informed and responsible attitude to the environment"
Friendly & hospitable people	The guidelines note that "this is not an environmental factor though it is indirectly covered under the 'Human Beings' section of the EIS". Refer to Section 6.3.5 for demographic details.
Safe & Secure	The Guidelines note that "this is not an environmental issue though some of the factors that are sometimes covered under the heading of 'Human Beings' – such as social inclusion or poverty – can point to likely effects and interactions". Refer to Appendix 6.1 for the Hazard Identification Risk Assessment. Refer also to Chapter 16 Major Accidents and Disasters
Easy, relaxed pace of life	The Guidelines note that "this is not an environmental issue though it is partially covered under 'Human Beings' see comments above". Refer to 6.3 on Receiving Environment.
Unspoilt environment	Biodiversity (Ch 12), Landscape and Visual (Ch 11). Emissions are addressed in Air Quality (Ch 8), Climate (Ch 9), Noise and Vibration (Ch10), Soils, Geology, Hydrology, Hydrogeology and Coastal Recession (Ch13) and Material Assets (Ch 15). Traffic is addressed in Roads and Traffic (Ch 7).
Nature, wildlife, flora	Biodiversity (Ch 12), Landscape and Visual (Ch 11).

Factor	EIAR Chapters / Notes
	<p>Emissions are addressed in Air Quality (Ch 8), Climate (Ch9), Noise and Vibration (Ch 10), Soils, Geology, Hydrology, Hydrogeology and Coastal Recession (Ch 13) and Material Assets (Ch 15). Traffic is addressed in Roads and Traffic (Ch 7).</p> <p>The guidelines note that “this topic also considers the effect on physical access to and visibility of these sites”.</p> <p>Access to Gobby Beach during construction is addressed in Construction (Ch 5). Visibility is addressed in Landscape and Visual (Ch 11).</p>
Interesting history and culture	<p>Landscape and Visual (Ch 11) and Cultural Heritage (Ch 14). The guidelines note that “the principal issues are to avoid damage to sites and structures of cultural, historical, archaeological or architectural significance – and to their contexts or settings. It also considers the effect on physical access to and visibility of these sites” Access and visibility to Martello Tower is addressed in Landscape and Visual (Ch 11) and Cultural heritage (Ch 14).</p>
Good range of natural attractions	<p>Biodiversity (Ch 12), Landscape and Visual (Ch 11) and Cultural Heritage (Ch 14).</p>
Plenty of things to see and do	<p>The Guidelines note that “this is not an environmental issue though it is partially covered by the Human Beings section, where tourism resources of an area are described and assessed. Refer to Section 6.3.2 for details on heritage and amenity.</p>

Ferry Terminal

Although Ringaskiddy is not currently a popular tourist destination, it is, and is expected to remain, an important tourist transit port.

Brittany Ferries operates two ferry routes from the Ringaskiddy terminal to France (Roscoff) and Spain (Santander). Both ferries twice a week from March to early November. The ferries have a capacity to transport 2,400 passengers (up to 650 cars).

The deep-water berth at Cobh has the capacity to handle very large cruise ships. Occasionally there are two or even three cruise ships in the Harbour. If the Cobh cruise ship berth is occupied, the other cruise ship or ships dock at Ringaskiddy. In 2018, 693 cruise ships and 157,669 passenger visits were reported for Cork Harbour (CSO). The cruise ships make a significant contribution to the local economy.

Military Fortifications

The lower harbour contains a number of important military fortifications such as Spike Island, Fort Davis, Fort Camden, Cobh Fort and Ringaskiddy Martello Tower, which contribute to the rich heritage and character of the harbour. Though Ringaskiddy itself is not a tourist destination, strategic plans are being prepared to develop the area as a more significant tourism and recreational attraction.

Spike Island

As discussed previously, there are already regular tours from Cobh to the military fortification on Spike Island. The Spike Island 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.

Port of Cork

The Port of Cork is undergoing works to significantly expand the facility, including the development of an amenity boat launch facility at Paddy's Point adjacent Haulbowline Bridge and UCC ERI Beaufort building. The Port of Cork's planning permission includes a walkway along the northern shoreline.

Haulbowline Island

As discussed previously, the Haulbowline Island Recreational Park, located on the former East Tip is due to open in 2019. There is potential for the redevelopment of the neighbouring former ISPAT/Irish Steel site in the future, located east of the proposed park.

6.3.4.2 Commercial and Industrial Premises

As discussed in **Chapter 2 Policy and Planning Framework and Need for the Scheme**, the Ballincollig Carrigaline Municipal District Local Area Plan 2017 was amended and adopted on 21 August 2017. The Plan zoned the principal part of the proposed development site from RY-I-20 (lands east of Hammond Lane) and RY-I-15 (lands west of Hammond Lane), both of which relate to zoning objectives related to industrial use. This is discussed in more detail in **Section 2.4.3.2 in Chapter 2** and the zoning map is illustrated in **Figure 2.4**.

Section 6.4.11 of the Cork County Development Plan 2014-2020 states that:

“the provision of strategic large-scale waste treatment facilities will be considered in ‘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”.

A considerable area of land in Ringaskiddy, including most of the site, is zoned for industrial development. IDA Ireland owns part of the industrial zoned land, with the remainder in private and Port of Cork ownership. IDA Ireland includes the Ringaskiddy area in its ongoing promotion of industrial development. Ringaskiddy is a significant centre of pharmaceutical manufacture at an international level. Since the late 1960s, some very large pharmaceutical manufacturing plants have been constructed in the area. Other businesses in the area include car importers, electronics manufacturing, and grain, cement and molasses storage.

Commercial service companies in Ringaskiddy include a small convenience shop, a public house and a public house/restaurant on the main street of Ringaskiddy village.

The Port of Cork company initially operating as the Cork Harbour Commissioners, has been developing the Ringaskiddy port facilities since the early 1980s. Port of Cork operate extensive port facilities in the harbour. In 2018 the Port of Cork handled 9.5 million tonnes of goods and 1,487 commercial ships entered the harbour (CSO). The Port of Cork the company operates a container and ferry port at Ringaskiddy. It's deep water berth at Ringaskiddy is of major economic importance to the region. Facilities at the deep-water berth can handle a range of cargo types, including roll-on roll-off, lift-on lift-off and dry bulk.

Cargo ships service the Tivoli Container Port, approximately 6km to the north west of the site. However, under Port of Cork's future strategic plan, the container terminal at Tivoli and the city quays are to undergo a phased move from 2020 and completed by 2025 to Ringaskiddy for which it has received planning permission. The land use and development policy for the Ringaskiddy area is for this industrial and port development to continue.

6.3.4.3 Commercial Fisheries

Vessels more than 12m in length are not permitted to fish within Cork Harbour. Vessels fish mainly out of Cobh and Crosshaven.

Boats are engaged in potting for lobster, edible or brown crab, Velvet crab and the common shore or green crab. Shrimp are also potted extensively in late summer and autumn. A limited amount of mullet fishing takes place during the summer months and trawling takes place, particularly later in the year for codling and flat fish. The channel between Spike Island and the Ringaskiddy shore is occasionally used as a trawling route for boats fishing for species such as plaice, skate and flounder when the conditions outside the harbour are too inclement for fishing. The edges of the channel below the low water mark are used for potting for Green Crab, Velvet Crab and Shrimp.

Occasional scallop fishing is undertaken south of Cuskinny on the southern shore of Great Island. Potting is undertaken extensively from inside the Dognose Bank (Fort Davis/Carlisle) along the rocky coast on the eastern side of the Lower Harbour. Up to 2,000 pots can be laid in this area at any one time and in general the area is considered very productive for all potted species. Potting for Shrimp, Crab and Lobster is also undertaken along the Great Island shore, east of Cuskinny, and to a limited extent in the East Ferry channel. Green crab is also fished in the North Channel, north of Great Island.

Trawling is undertaken in several places around the harbour especially along the shelf bordering the main channels.

Netting for Mullet is undertaken around Aghada, mainly during the summer.

Over-fishing is a threat to all fisheries and responsible management and conservation of the resources are required if long-term sustainability is to be ensured. In light of this, Lobster conservation measures have been adopted by the Cork Harbour fishermen in line with their counterparts around the Irish Coast.

6.3.4.4 Aquaculture

Mussel culture is totally banned in Cork Harbour because of the prevalence of the organisms that cause Paralytic Shellfish Poisoning. Oysters are the main species cultivated. The Sea-Fisheries Protection Authority (SFPA) lists⁴ three sites within Cork Harbour classified as production areas for bivalve mollusc production (North Channel West, North Channel East and Rostellan). All three sites are classified for oyster production. Rostellan is noted by the SFPA as being a 'Dormant Fishery', having been dormant for at least 12 months.

This designation requires minimum standards of water quality to be maintained under European Communities (Quality of Shellfish Waters) Regulations 2006 (S.I. No. 268 of 2006), as amended. It also obligates public authorities to report information relevant to water quality in designated areas to the Department of Housing, Planning and Local Government.

6.3.5 Demographics

In general, the demographic data quoted throughout this chapter is from the most recent Census (2016). Data from the Labour Force Survey (formerly the National Quarterly Household Survey) has also been used. It is noted that in January 2019, legislation was passed which finalised the revision of Local Government boundary arrangements in Cork. This means that from May 31st 2019, the transition areas of Ballincollig, Blarney, Tower, Glanmire, Douglas Donnybook, Grange, Frankfield, Rochestown and Togher became part of the Cork city rather than Cork county. Refer to the Cork County Council website⁵ for further details.

The Central Statistics Office (CSO) has been used as a source of information to characterise the study area. Where applicable the study area has been described in terms of the local Electoral Divisions and Small Areas. Ireland is divided into 3,441 ED⁶ and there are 18,641 Small Areas. Small areas are generally towns and villages around the country. As discussed in **Section 6.3.2.1**, Ringaskiddy is included in the electoral division of Carrigaline (ED number 082) and specific statistics can be found for the Ringaskiddy-Loughbeg area under the CSO Small Area Population Statistics (SPAS) database.

The boundaries of some local electoral areas have also changed. Detailed census data for the new reconfigured boundaries is not yet available therefore the 2016 census data is relied upon in this chapter.

⁴ Sea-Fisheries Protection Authority, 2018/2019 List of Classified Bivalve Production areas in Ireland (Available at: https://www.sfpa.ie/LinkClick.aspx?fileticket=C2Jk_m4pPI8%3d&portalid=0&resourceView=1)

⁵ <https://www.corkcoco.ie/en/accessibility-maps-publications/cork-boundary-change-information>

⁶ Department of Housing, Planning and Local Government (2018) Local Electoral Area Boundary Committee No. 1, Report 2018, available at: https://www.housing.gov.ie/sites/default/files/publications/files/local_electoral_area_boundary_committee_no.1_report_2018.pdf

6.3.5.1 Recent Trends in Population

The smallest geographical units distinguished by the Central Statistics Office (CSO) are Electoral Divisions (ED).

As discussed above the EDs were reconfigured on the 31st May 2019 after the revision of Local Government boundaries in Cork. The Census data for these realigned boundaries has not been reconfigured and therefore the CSO data presented in this chapter represents the ED boundaries at the time of the 2016 Census

The Indaver site is located within the Carrigaline ED (082) within the Ballincollig-Carrigaline Electoral Area. The Ballincollig-Carrigaline Electoral Area comprised of eight Electoral Divisions in total at the time of the 2016 Census.

Carrigaline (ED 082) includes the villages of Ringaskiddy and Shanbally and Carrigaline town north of the Owenboy River. Liscleary (ED 193) comprises of the western parts of rural Carrigaline and the town, and Carriagline (ED 183) comprises of the south-eastern areas of Carrigaline town and south-eastwards to Myrtleville and Minane Bridge.

Table 6.4 outlines the population change between 2011 and 2016 and the growth rate of these population figures. The populations increased overall, particularly in the areas south-east of Carrigaline town which showed a +30.5% population increase from 2011 to 2016. The population in the electoral division of which the development is proposed (Carrigaline 082) showed a population increase of +2.5%, below the state, county and nearby ED percentage of population change for the same period.

Under the Small Area Population Statistics (SAPS), Ringaskiddy “settlement” (including Loughbeg) was recorded as having 580 residents in the 2016 CSO Census, a population increase of +21.3% from the 2011 Census of 478 people.

Table 6.4 Population change for State, County Cork, Cork City, and Carrigaline local areas from 2011-2016

District (Electoral Division No.)	2011	2016	Change from 2011-2016 (%)
State	4,588,252	4,761,865	+3.7
Cork County	399,802	417,211	+4.3
Cork City	119,230	125,657	+5.3
Carrigaline ¹ (082)	11,818	12,118	+2.5
Carrigaline (183)	1,878	2,462	+30.5
Liscleary (193)	4,385	4,641	+5.8
Ringaskiddy-Loughbeg ²	478	580	+21.3%

Note 1 – Includes Ringaskiddy village

Note 2 – Small Area Population Statistics, CSO

(Data source: CSO website www.cso.ie)

6.3.5.2 Household Size

Table 6.5 below outlines the average household size in each of the geographical areas assessed. The statistics illustrate an increase in household size from 2011 to 2016 across all districts. However, the household size in the area of the proposed development (Liscleary) is still higher than the State, City and County for 2016. The data was not available for Ringaskiddy-Loughbeg under SAPS.

Table 6.5 Average Household Size (persons per household) for 2011 and 2016 (CSO)

District (Electoral Division No.)	2011	2016	Change from 2011- 2016
State	2.73	2.75	0.02
Cork City	2.4	2.4	No change
Cork County	2.8	2.8	No change
Carrigaline ¹ (082)	2.96	3.00	+0.04
Carrigaline, Co. Cork (183)	2.59	2.73	+0.14
Liscleary (193)	3.25	3.27	+0.02

Note 1 – Includes Ringaskiddy village
(Data source: CSO website www.cso.ie)

Under the SAPS, the 2016 Census reported 203 households in the 'settlement' of Ringaskiddy-Loughbeg, of which, the majority of households were characterised as 'Married couple with children' (28.5%), 'One person' households' (27.0%) and 'Mother and children' households (11.8%). Of the 202 permanent private households in Ringaskiddy recorded in 2016, the majority of permanent private households were characterised as owner occupied, with a mortgage (29.2%) or without a mortgage (31.6%).

Under SAPS, the 'settlement' of Carrigaline town was reported in the 2016 Census as having a population of 15,770 people and 5,220 households of which the highest proportion (43.1%) are described as 'Married couple with children'. In 2016, The majority of private households are long-term residents i.e. owner occupied, which accounts for 75.6% (or 3,950 households) of total private households in the town (5,219).

6.3.5.3 Age Profile

Table 6.6 shows the age cohorts for 2016 across the State, Cork City, Cork County and Carrigaline town and Ringaskiddy. The statistics show that Carrigaline and Ringaskiddy has a young growing population with the percentage of people aged below 14 years is above the State, city percentage at 26.4% and 22.6% respectively.

Table 6.6 Age cohorts for the State, city and county for the Census 2016 (CSO)

District	0-14 years	15-24 years	25-44 years	45-64 years	65+ years
State 2016	21.1%	12.1%	29.5%	23.8%	13.4%
Cork City 2016	14.3%	16.4%	31.3%	22.3%	15.7%
Cork County 2016	22.9%	11.2%	28.4%	24.6%	13.0%
Carrigaline ¹	26.4%	12.0%	30.9%	23.3%	7.4%
Ringaskiddy-Loughbeg ¹	22.6%	15.3%	34.7%	16.4%	11.0%

Note 1 –Census 2016 Small Area Population Statistics (SAPS)

Under the SAPS, in the 2016 Census, 6,917 of people aged 15 years and over in Carrigaline were categorised as 'At work'. This figure accounts for 60.0% of the population compared to 4.6% of people whose economic status was registered as 'Unemployed having lost or given up previous job'. Those with an economic status of 'Student' or 'Retired' accounted for 22.4% collectively in 2016 in Carrigaline.

In 2016, 219 of people aged 15 and over in Ringaskiddy-Loughbeg were categorised as 'At work' which accounts for 48.7% of the population compared to 6.6% of people whose economic status was registered as 'Unemployed having lost or given up previous job'. Those with an economic status of 'Student' or 'Retired' accounted for 27.1% collectively in 2016 in Ringaskiddy-Loughbeg.

6.3.6 Recent Trends in Employment

Recent trends in employment were evaluated using CSO information generated from the 2011 and 2016 Censuses and Small Area Population Statistics (SAPS) The information was compiled on the basis that:

The labour force is comprised of all persons at work, looking for their first job or unemployed while students, homemakers, retired persons and those unable to work are not categorised in the labour force.

The participation rate is the proportion of persons in the labour force aged 15 years and over expressed as a percentage of all persons aged 15 years and over.

Statistics shown in **Tables 6.7** and **6.8** below outline the employment figures for the State, Cork City and Cork County, and in the main towns near Ringaskiddy, respectively. The statistics show that the employment rate for Cork county is largely in line with that of the State. Cork City is below the State labour force participation rate.

Tables 6.7 show that there was an increase in the total number of persons aged 15 years and over at work in the State and in Cork City and County in the period 2011-2016. Percentage rates of participation in the labour force decreased slightly during the same period except for Cork City which saw a slight increase. Similarly, there was an increase in persons employed in Ringaskiddy-Loughbeg and local towns during the same period as shown in **Table 6.8**.

Table 6.7 Employment figures for the State and Cork City and County for persons 15 years and over for 2011 and 2016. Source CSO

Area	Total Persons		At Work		Unemployed (ex 1st time job seekers)		Labour Force Participation Rate (%)	
	2011	2016	2011	2016	2011	2016	2011	2016
State	4,588,252	4,761,865	1,807,360	2,006,641	390,677	265,962	61.9	61.4
Cork City	119,230	125,657	43,062	50,483	11,251	8,024	54.4	55.2
Cork County	399,802	417,211	164,441	179,890	26,597	16,460	62.7	61.6

(Data source: CSO website www.cso.ie)**Table 6.8 Employment Figures for the main towns near Ringaskiddy (Persons 15 Years and Over). Source Census 2016 Small Area Population Statistics, CSO**

Town	Unemployed (ex. first time job seekers)		At Work	
	2011	2016	2011	2016
Ringaskiddy-Loughbeg	38	30	183	219
Carrigaline	1,023	540	6,211	6,971
Cobh	967	765	4,702	5,093
Monkstown/ Passage West	426	285	2,317	2,522

(Data source: CSO website www.cso.ie)

Labour Force Survey

The Labour Force Survey Data (formerly the National Quarterly Household Survey) statistics for the first quarter (Q1) of 2019 (January to March) show that there was an annual increase in employment of 3.7% or 81,200 in the year to the first quarter of 2019, bringing total employment to 2,301,900. This compares with an annual increase of 2.3% or 50,500 in employment in the previous quarter and an increase of 2.9% or 62,400 in the year to Q1 2018.

Employment in the construction sector increased by 8,00 or +5.8% in the year to the Q1 2019.

Table 6.9 shows the distribution of employment sectors in 2016 in Ringaskiddy-Loughbeg and locally. Commerce and trade, manufacturing industries, and professional services are significant employment groups in Ringaskiddy-Loughbeg and the surrounds.

Table 6.9 Distribution of employment by broad industrial group in towns near Ringaskiddy (number of persons aged 15 years and over) 2016. Source: Small Area Population Statistics, CSO)

Employment Sector	Ringaskiddy-Loughbeg	Cobh	Monkstown / Passage West	Crosshaven / Churchbay	Carrigaline
Agriculture, forestry and fishing	2	23	17	13	21
Building and construction	7	181	142	78	404
Manufacturing industries	52	930	414	176	1,493
Commerce and trade	51	1,119	664	247	1,737
Transport and communications	17	447	233	81	588
Public administration	9	455	101	51	329
Professional services	49	1,018	626	246	1,572
Other	32	920	325	188	827
Total	219	5,093	2,522	1,080	6,971

6.3.7 Health Status of Population

6.3.7.1 Population

When the potential effects on human health of any emissions are assessed, amongst the most important factors to be considered will be, the number of people who may be exposed, the duration of that exposure and the vulnerability or sensitivity of those individuals to those emissions.

Residential areas, public and private health facilities, workplaces, commercial areas and educational facilities are particularly important because significant numbers of persons usually spend significant time at these locations.

Places of worship and recreational areas are also important because of the significant numbers but the fact persons usually spend less time in these places, may be relevant for some emissions.

Agricultural areas usually have limited numbers of persons present and for a limited time but farm residences themselves are considered like any other homes.

The sensitivity of an area in this context refers to the vulnerability of the population. Vulnerable persons include the sick, the very young or old. Receptors that are considered to be very highly sensitive include health care facilities, both public and private, as these are more likely to include the elderly ill or infirm. Sensitive receptors also include schools, because of the children. When health impacts are assessed particular attention must be given to these groups.

A considerable number of industries are situated in the Ringaskiddy area. This means that a considerable number of people work in area. When assessing environmental impact there are several reasons why persons at work are less vulnerable than, for example, residents. The most obvious of these is time. People typically spend about 40 hours per week in a work area whereas much more time is spent in the home. Of course, some people who work in the area will also live in the area but again their exposure would not be expected to be any greater than a home maker for example who lives and works in the home. Also, the population at work is less likely to include the vulnerable such as the very young, the very old and the ill. For these reasons, environmental levels designed to ensure the safety of residents it will automatically be sufficient to protect those at work.

This of course should not be confused with the workers in the facility itself who have potentially higher exposure than environmental levels. While their safety is part of the role of the Health and Safety Authority, the most appropriate measure of workplace exposure for these individuals is the Occupational Exposure Limits Values or OELVs.

6.3.7.2 Community Health Profile

Physically the proposed development lies in Cork County Council local authority area. Evidence shows that different communities have varying susceptibilities to health impacts both positive and negative as a result of social and demographic structure, behaviour and relative economic circumstance.

Whilst specific health data for individuals in the vicinity of the proposed facility is confidential and difficult to establish, as has been detailed in the methodology section above, a community profile has been used to establish the baseline and identify unequal distributions in existing factors such as deprivation or burden of poor health, in order that changes in community exposure to certain health pathways and their degree of impact on the population or community can be assessed.

A group made up of the Health Services Executive, Lenus and the Irish Health Repository have published health profiles for all the Local Authorities areas in Ireland, County Health Profiles (Lenus, 2015).

There are separate health profiles available for all local authority areas. The most recent profiles published relate to 2015 and have been used to establish a community health profile for the proposed drainage scheme.

The key facts in the Health Profile relating to Cork County (Lenus, 2015) are:

- Fourth most affluent local authority area nationally.
- Below average deprivation; it has as a low rate of lone parent households at 9.9% (national rate 10.9%); persons with no formal or primary education only at 12.2% (national rate 15.2%) and local authority housing rate of 5.2% (national rate 7.8%).
- Lowest percentage of those who consider their health to be bad or very bad of 1.1% (national rate 1.5%).
- A birth rate to those under 20 years of age of 6.2 (national rate 12.3) and has the highest breast-feeding rate nationally of 54.4% (national rate 46.6%).
- A suicide rate of 12.7 (national rate 11.3 and below average self-harm rates).

It is important to realise when viewing these figures that they relate to the entire administrative area which is Cork County. They are based on the then census population of 399,802 (2011 Census data). While we can take these figures as being correct, they do not necessarily accurately reflect the health profile of smaller areas which are close to the project. For example, it identifies that the council area is the fourth most affluent in Ireland. The map of deprivation included in the profile shows large areas at average or above average affluence levels. There are nevertheless areas of deprivation where the statistics above, simply do not apply.

It is not possible to get reliable baseline information though on small scale populations reasons outlined elsewhere in this chapter. The data above also qualified in this manner nevertheless does give a valuable insight into the general area.

The proposed facility boundary is 4.8 kilometres from the southern periphery of Cork city so it useful to consider the health profile of that area as well

For Cork City (Lenus, 2015) the key facts are:

- A low dependency ratio of 42.3% (i.e. The number of those aged 5-14 and 65 years and over as a percentage of those aged 15-64) - national 49.3%.
- High rate of lone parent households of 11.8% (national rate 10.9%), and local authority housing 15.4% (national rate 7.8%). A higher than average rate of births to women aged less than 20 years.
- High percentage of those with a disability of 17.7% (national rate 13.0%).
- Lowest national rate of births for all ages of 12.2 (national rate 15.8) and has the highest breast-feeding rate of 54.4% (national rate 46.6%).

- Highest suicide rate at 17.8 compared to national rate 11.3 and above average self-harm rates.
- Immunisation uptake at 24 months for the 3rd 6 in 1 of 94% and MMR1 of 90% are lower than the national average (for North South Lee).

Similar qualifications as outlined above in relation to the County Cork data also apply here.

The population of the area is given as 119,930 based on the 2011 census, the most recent available at the time of the profile. When one looks at the deprivation map in the health profile it is clear that the area to the north of the city has some of the areas of highest deprivation whereas the part of the city that has closest proximity to the proposed facility had generally average or above average levels of affluence.

Other data on the health profile of the community in Cork can be found from Cancer data compiled by the National Cancer Registry of Ireland (NCRI). From the most recent data available 2004-2015, mapping invasive cancer rate Cork County has invasive cancer rates slightly above average for Ireland. This is largely attributable to higher rates of bowel cancer and to a lesser extent breast cancer.

There has, in the past, been reported high cancer rates around Cork Harbour and in Cobh in particular. It is interesting the NCRI found it appropriate to issue a statement on this. In fact, they issue a similar statement twice, initially in 2011 and subsequently in 2016

It stated:

Recent media coverage has interpreted information from the National Cancer Registry as suggesting a link between cancer rates in Cobh, Co. Cork and a former steel plant on Haulbowline Island, near the town. The Registry does not believe that this interpretation is correct, for a number of reasons.

- Although cancer risks in Cobh for some cancers are above the national average, half of the areas in the country will always be above average, and this is meaningless in itself;
- Cancer rates in Cobh are not exceptional when compared to similar towns. Many towns in Ireland have higher cancer rates, with no suggestion of external factors;
- While the risks of some cancers in Cobh are above average, the risk of many others is below average. Selective reporting of the high rates only serves to cause unnecessary worry to residents;
- As cancers take 15 to 20 years to develop, it is impossible to link recent exposures to current cancer risk or changes in risk.
- No exposure has been identified which could cause an increase in the risk of such a wide range of cancers as has been suggested for Cobh—cancers of the lung and prostate, for instance, have no risk factors in common—and cancer risk to the population of Cobh is caused by a combination of many factors.

These factors are well known and mostly related to behaviour or lifestyle—for instance smoking, diet, exercise, alcohol—and the cancer data shows that the population of Cobh is similar to that of towns of similar size in these characteristics.

The National Cancer Registry is an independent body which continuously monitors cancer rates and risks to the Irish population. The information is freely available for people to study and draw their own conclusions, and we have recently published an atlas of cancer risk for the whole island of Ireland. This shows that cancer risk varies by area, but not in any consistent way for different cancers, and that there is no cancer “blackspots” with increased risk for all cancers.

In reality then while rates may vary the National Cancer Registry of Ireland (NCRI) have clearly stated that there are no cancer black spots.

It is somewhat more difficult to get reliable data on respiratory illness such as COPD and asthma. We know for example that whilst approximately 1 in 8 persons suffer from asthma, it is not possible to map those as there is no register for asthma sufferers in the same way as there is one for cancers. There is some evidence that asthma rates in Ireland are quite high by International standards.

We have to use surrogate measures. One such surrogate measure is hospital admissions for COPD and asthma. The National Patient Safety Office and Department of Health publish annual reports, the most recent available is 2017 titled National Healthcare Quality Reporting System (DOH, 2017).

For COPD the Hospital Admission Rate in Cork County was 337 per 100,000 as opposed to a National Average of 384 per 100,000. This suggests a slightly lower rate of COPD admissions in Cork than average in Ireland. Again, these figures must be treated with some caution but certainly does not suggest a problem in Cork that is not elsewhere.

For asthma admissions the picture is that 44.9 admissions per 100,000 per year for asthma Cork is almost exactly average for the country of 43.5 per 100,000. This could be compared to figures such as Donegal where the rate is 73 per 100,000. Again, the standard warning is there about misinterpreting these figures, but we can state that there is no evidence that Cork is any worse than anywhere else in Ireland.

6.4 Characteristics of Proposed Development in the context of Population and Human Health

The proposed development will consist principally of a waste-to-energy facility (waste incinerator) for the treatment of up to 240,000 tonnes per annum of residual household, commercial and industrial non-hazardous and hazardous waste and the recovery of energy. Of the 240,000 tonnes of waste, up to 24,000 tonnes per annum of suitable hazardous waste will be treated at the facility.

The proposed development will generate additional traffic, and noise and air emissions, which will be within the applicable emission limits. No process or sanitary effluent will be discharged to Cork Harbour. Emissions from the facility are addressed in the relevant sections of the EIAR.

Up to 320 people will be directly employed during the construction phase. Up to 63 people will be directly employed during the operational phase.

In addition to the provision of the waste-to-energy facility, the proposed development will include an upgrade of a section of the L2545 road, a connection to the national electrical grid, an increase in ground levels in part of the site, coastal protection measures above the foreshore on Gobby Beach and an amenity walkway to the Ringaskiddy Martello Tower.

The L2545 upgrade will reduce flood risk on the road which will be of benefit both to the Ringaskiddy Resource Recovery Centre and also to the other existing users of this road including the UCC Beaufort, NMCI, the crematorium on Rocky Island and the Naval Base on Haulbowline Island. Future development of Haulbowline as a public park will also benefit due to the improved upgrade of the L2545. The increase in ground levels in part of the Indaver site will reduce flood risk.

A new bitumen macadam footpath will be constructed to give access from Gobby Strand to the Martello Tower. It is proposed to run along the eastern edge of the site and will be fenced with a low timber fence along the eastern edge. A viewing area will be provided at the higher south east corner of the site providing expansive views over Cork harbour, Spike Island and Cobh.

Coastal protection in the form of sacrificial material is proposed above the foreshore along the section of Gobby Beach owned by Indaver in order to slow the rate of coastal recession.

If the proposed development proceeds, Indaver will be required (as part of the planning permission conditions) to establish a community benefit fund to fund environmental and other community projects and initiatives in the Ringaskiddy area. The value of the fund will amount to €240,000 per year (€1 per tonne of waste accepted). Refer to Conditions 18 and 19 of the 2018 An Bord Pleanála Board Order (04PA0045) regarding the grant of planning for the 2016 planning application. Refer also to **Section 6.5.4.5** for further details on same.

6.5 Likely Significant Effects

6.5.1 Introduction

Impacts on humans as a result of the proposed development have been considered in detail in other chapters of this EIAR, as follows:

Chapter 5 Construction Activities,

Chapter 7 Roads and Traffic,

Chapter 8 Air Quality,

Chapter 9 Climate,

Chapter 10 Noise and Vibration,

Chapter 11 Landscape and Visual,

Chapter 12 Biodiversity,

Chapter 13 Soils, Geology, Hydrogeology, Hydrology and Coastal Recession,

Chapter 14 Cultural Heritage,

Chapter 15 Material Assets,

Chapter 16 Major Accidents and Disasters.

The effects of the proposed development on human beings in relation to health and safety, residential and recreational amenity and economic activities are evaluated in the following sections.

6.5.2 'Do Nothing' Scenario

6.5.2.1 Population

Based on past trends and current planning policy at development plan and local area plan level, it can be expected that industrial and port development will continue in the Ringaskiddy area. The Port of Cork expansion project will involve a substantial expansion of Ringaskiddy Port. Residential development in Ringaskiddy and Shanbally villages will be confined to that which is required to meet local needs.

Residential and other development will continue in other areas around Cork Harbour, apart from in the coastal areas zoned for protection. Amenity and tourism developments are proposed for Spike Island and near completion at Haulbowline Island, in the vicinity of the proposed Resource Recovery Centre.

The UCC ERI Beaufort building and campus for third level marine and energy research and related uses has recently opened Lir, an ocean energy test facility at the campus located north of the proposed Resource Recovery Centre. Future development at the campus is likely. Lands west of the campus have been granted planning (File No. 184712) for the '*temporary use of lands for open storage of port related cargo and all associated works including site reprofiling works, road/kerbside re-alignment and security fencing*' in an application made by Port of Cork.

One consequence of this general development will be an intensification of industrial, port and other activity adjacent to Ringaskiddy village, and in the Lower Harbour. This development will take place regardless of whether the proposed Resource Recovery Centre is built or not.

Cork County Development Plan (2014) identifies Ringaskiddy as Strategic Employment Area and under the Ballincollig Carrigaline Municipal District Local Area Plan 2017 states that the site is "[s]uitable for the extension of the opposite *Third Level Educational campus and enterprise related development including marine related education, enterprise, research and development*", therefore, it is probable that it would be developed if the proposed development does not proceed.

If the proposed development did not go ahead, the L2545 road would continue to flood following heavy rainfall because the road drainage is inadequate. In the scenario where the proposed sacrificial beach material was not to be undertaken, coastal recession would continue as it is at present.

In a do-nothing scenario there will remain a deficiency of appropriate waste management options for the Cork and Munster areas which may hinder development of the urban areas and industry.

6.5.2.2 Human Health

Given the nature of the proposed development, human health has primarily been assessed in terms of air quality and also noise (for the construction phase particularly).

Chapter 8 Air Quality, concludes that, for the “Do Nothing” scenario the existing air quality emission sources contained within the area of the proposed development will remain in place. Therefore, the existing baseline air quality environment is not expected to change in the “Do Nothing” scenario.

Chapter 10 Noise and Vibration, concludes that in the event that the proposed development does not proceed, the existing noise environment in the vicinity of the site are expected to remain unchanged assuming no additional development in the area. There are a number of additional developments proposed within the area however, which have the potential to alter the existing environment including the M28 Cork to Ringaskiddy Motorway Scheme and the Port of Cork development. The noise environment resulting from these proposed developments will introduce new sources to the surrounding environment and are likely to lead to increased noise levels at noise sensitive locations in proximity to these developments.

In a do-nothing scenario there will remain a deficiency of appropriate waste management options for the Cork and Munster areas which may hinder development of the urban areas and industry.

Based on past trends and current planning policy at development plan and local area plan level, it can be expected that residential development in Ringaskiddy and Shanbally villages will be confined to that which is required to meet local needs.

In summary, under the ‘do-nothing’ scenario, if the proposed development were not to go ahead, it is unlikely that the community population health status would change from the current baseline.

6.5.3 Amenity Aspects during Construction

Traffic Aspects in relation to Residential Amenity

Traffic congestion has the potential to affect how the local population use and access local residents use amenities. It is clear from the extensive consultations which Indaver has carried out with both the local community and the statutory authorities that traffic congestion on the main N28 approaches to Ringaskiddy and to the site, and how this congestion should be managed during the peak hours, is a major concern. The impact of the generated traffic on the local road network is assessed in **Chapter 7 Roads and Traffic** of this EIAR and mitigation measures which Indaver intend to include in their development proposals are investigated where necessary.

With all of the above issues in mind, Indaver has approached the design, construction and operation of the Resource Recovery Centre on the principle of minimising traffic at peak periods where possible.

It is anticipated that the road upgrade and drainage works would commence at the beginning of the project and progressed to completion as soon as possible. The first task of the road upgrade will be to construct a temporary two-way road, approximately 250m long, to the south of the existing road to create working space for the construction of the raised section of the road, the upgraded drainage system and the diversion of services. The traffic will be diverted onto the temporary road until the upgrade works have been completed. A construction traffic management plan will be in place to manage traffic effects. It is estimated that temporary road will be in place for a twelve-week period during the road upgrade works. During the twelve-week period, the Gobby Beach car park may be temporarily closed for up to six weeks however access to the beach will be maintained for the duration of the works

Recreational Amenity During Construction

The operation of the proposed development will not encroach on the shoreline amenity. However, due to the close proximity of the truck traffic on the internal roads of the proposed development and the presence of the large building, the shoreline will be more subject to traffic noise and will have a more industrial ambience than it does currently. Similarly, the amenity of the L2545 road on the northern side of the facility will be reduced as the site frontage will have a greater industrial ambience, even with the proposed planting and screening. A public amenity footpath will be provided on the eastern and southern sides of the site, from the boundary near the shoreline to the southern site boundary close to the Martello Tower. The recreational amenity for boat traffic in the West Channel will be slightly reduced as the site will have a more industrial ambience than it has currently.

The effect on landscape is assessed in **Chapter 11 *Landscape and Visual*** of this EIAR. There are not expected to be any other impacts on recreational amenity.

Gobby Beach

Approximately 1,100m³ of imported rounded shingle of appropriate size will be placed, as sacrificial material, at the toe of the glacial till face on Gobby Beach which forms the eastern boundary of the site. The works will extend along the beach from near the car park at the northern end of the Indaver site to the southern boundary of the Indaver site. The material will be deposited above the high-water mark.

The placement of the sacrificial beach material (shingle) required for the coastal protection works will take approximately three weeks to complete. It is envisaged that the first instalment of the shingle will be undertaken towards the end of the construction phase.

The imported shingle will be transported by road and temporarily deposited at the car park at Gobby Beach. A bulldozer will be used to spread the imported shingle in the designated area. It is anticipated that access for construction machinery across the beach will be facilitated by laying down temporary tracks.

To ensure the safety of the general public, it is envisaged that the area of the beach, in which the construction works will take place and the area of the car park in which the materials will be stored, and which will be used by the machinery, will be closed to the public for the duration of the proposed works, approximately three weeks. However, access to the rest of the beach will be maintained for the duration of the works.

The traffic impacts associated with this construction activity will be minor and are addressed in **Chapter 7 Roads and Traffic**. In addition, the shingle will be replenished as required in the future but it is unlikely to be required on a frequent basis. It is envisaged that replenishment may be required every two to five years but it depends on the duration of the material remaining on site. Further details are provided in **Chapter 13 Soils, Geology, Hydrogeology, Hydrology & Coastal Recession** of this EIAR. The impacts experienced for the initial instalment of shingle will be repeated during replenishment.

In addition as detailed above, during the L2545 works, Gobby Beach car park may need to be closed for up to 6 weeks to facilitate the construction works. However, access to the beach will be maintained for the duration of the works.

6.5.4 Economic Effects during Construction

The construction of the proposed development will cost in excess of €160 million. There will be a maximum number of 320 jobs created during construction. There will also be a substantial number of indirect jobs, created in the off-site construction services providers and material suppliers. These jobs will be a beneficial economic impact of the proposed development. In addition, it is envisaged that local shops, pubs and service providers in the area will experience increased trade during the construction phase.

In general, the development will lead to a general increase in economic activity in the area.

6.5.5 Health and Safety (during Construction and Operation)

As discussed in **Section 16.5.1 of Chapter 16 Major Accidents and Disasters**, there are no special or unique hazards associated with the construction of the plant on this particular site that would not be encountered on any normal construction site for an industrial building.

As discussed in **Section 5.13 of Chapter 5 Construction Activities**, a Health and Safety Plan will be prepared which will address health and safety issues from the design stages through to the completion of the construction and maintenance phases as required by the Safety, Health and Welfare at Work (Construction) Regulations 2013.

Hazard Identification and Risk Assessment Study

As outlined in **Chapter 16 Major Accidents and Disasters**, Indaver carried out a hazard identification and risk assessment (HAZID&RA) for the development. In accordance with the European Commission's EIA guidance, there are two key considerations to consider:

- The Project's potential to cause major accidents and/or disasters for human health, cultural heritage and/or the environment;
- The vulnerability of the Project to potential disaster/accident.

The assessment of the vulnerability of the development to risks of major accidents and disasters is included in this EIAR in accordance with the EIA Directive 2014/52/EU which states the need to provide a description of "*the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned*". The risk assessment is included as **Appendix 6.1**.

Notwithstanding the fact that the proposed development will not be a major accident establishment, a number of accident scenarios were assessed in the study to determine the risk each posed to human health and the environment. Following industry best practice, five risk ratings of increasing significance, based on the probability of occurrence and the hazard posed, were assigned to the scenarios. The risk ratings were trivial, minor, moderate, substantial and priority. No priority risks were identified, and one substantial risk was identified. The substantial risk was a fire in the bunker.

Control measures are proposed as part of the proposed development (Refer to **Chapter 4 Description of the Proposed Development** of this EIAR and **Appendix 6.1 Hazard Identification and Risk Assessment (HAZID) Report**). The study concluded that, with the control measures in place, the risks posed to human health and the environment by the facility will be as low as reasonably practical (ALARP). The report of the Hazard Identification and Risk Assessment is provided in **Appendix 6.1**. The risk assessment also confirmed that the proposed Ringaskiddy Resource Recovery Centre will not be a major accident establishment and that the Seveso III Directive and Regulations will not apply to the centre. **Chapter 16 Major Accidents and Disasters** also presents an assessment of the likely significant adverse effects on the environment arising from the vulnerability of the proposed Resource Recovery Centre at Ringaskiddy to risks of major accidents and/or disasters. The conclusions of that chapter are that there are no major accident hazard implications during the construction phase of the proposed development. The accident scenarios discussed in **Chapter 16** mainly relate to hazards associated with the storage and handling of dangerous substances or the storage and handling of waste at the site.

As such, these hazards will not arise until after the construction phase has been completed and the operational phase has commenced.

A discussion of the effects arising from normal operations of the plant is provided in other chapters of this EIAR. There are no residual effects associated with the scenarios discussed in **Chapter 16**, except in the case of an accident scenario. In the event of an accident occurring during operations, Indaver will have emergency response measures in place to minimise the impacts to human health and to the environment. As the site will be licensed by the EPA, Indaver has conducted an environmental liabilities risk assessment (ELRA) and prepared a closure restoration and aftercare management plan (CRAMP), in accordance with the EPA's guidance both of which have been included in the licence application to the EPA.

Indaver has also prepared ELRA's for their operations at Carranstown and at Dublin Port and a similar approach has been adopted for the assessment at Ringaskiddy. In accordance with the EPA's guidance, Indaver has put the appropriate financial provisions in place at these other sites to cover the liabilities and potential liabilities identified in the ELRA.

Indaver will ensure that appropriate financial provisions are in place, accordance with the EPA guidance, for the Ringaskiddy site also.

6.5.6 Effects on Human Health (during Construction and Operation)

6.5.6.1 Health Protection

Emissions to Air

All construction of the facility will take place several hundred metres from the nearest residence. Construction dust by its nature is heavy and disperses over a confined area as it falls to ground. The exact nature of the dust depends on the nature of the soil being excavated and the construction materials used. Mitigation measures, in terms of dust control, on the construction site with sound construction methods will minimise any effects and these are outlined in **Chapter 8, Air Quality** and **9 Climate**. While in a construction project of this scale it is inevitable that there will be occasional dust generation, this is likely to be very localised in place and time. As detailed in **Chapter 8, Air Quality** and **9 Climate**, it is extremely unlikely that the construction activities will result in air quality standards being exceeded over any significant period of time in the environment outside the construction site. It can, therefore, be stated with confidence that there will be no significant human health effects arising from emissions to air including dust generation.

As for the operational phase while it has been suggested that emissions from incinerators cause various health effects. There have been extensive studies of the potential health effects of incinerators on human health. A literature review of peer-reviewed research papers reporting these studies is detailed in **Section 6.2.5** above.

The review noted that many of the studies on health effects are of historical incinerators which had much higher emissions than the incinerator proposed as part of the Resource Recovery Centre and predate the various EU Directives which have imposed stringent limits on emissions.

In relation to this facility, as outlined in **Chapter 8 Air Quality** and **9 Climate**, even with worst case scenario with maximal permissible emissions to air, in worst case weather and environmental conditions, no Air Quality Standards will be breached at the nearest or indeed any receptors

When one looks at the other Indaver incinerator in Ireland in Carranstown, Co. Meath, and it's efficient operation it is clear that in practice as well as in theory that there will be no adverse effects on Air Quality. Therefore, it can be concluded, according to evidence in the literature, that modern well-run incinerators will not have a deleterious effect on human health.

The predicted impact of the proposed development based on site specific effectors is assessed below.

Dioxins

The results of dioxin sampling performed and detailed separately below in **Section 6.5.4.3** of this chapter shows that background soil PCDD/F concentrations for the sites sampled in the Ringaskiddy area were typical of a mixed urban/rural area. The PCDD/F values measured in the survey are well below any of the recorded levels or limits defined in the above literature and are low by international standards. This is despite the history of heavy industry in the area, most particularly the Irish Steel plant in the vicinity which now is closed. This source in particular, given the nature of the activity that was carried out there and recent well publicised soil contaminations within the plant itself, is likely to have emitted pollutants including dioxins far in excess of those which will be emitted by the proposed facility. It is doubly reassuring therefore that despite this the baseline levels are good.

It is of note that when the MARI (a theoretical Most At Risk Individual) is considered there is a small increase in weekly dioxin dose which remains well below the TWI (Tolerable Weekly Intake). It is estimated indeed that the increase is only 1.2% of the TWI. We use the theoretical being MARI because if the most vulnerable individual conceivable is unaffected then all individuals are unaffected. In fact, this MARI does not exist as it is based on many “worst case” assumptions. No human being will be exposed to the extent of MARI and as MARI’s exposure shows a very small increase (1.2%), we can all be very reassured that Dioxins and Furans will not increase significantly.

Because of the absence of impact on the local levels and bearing in mind most human dioxin exposure is dietary anyway and the food we eat and the milk we drink usually comes from far and wide it is a straightforward conclusion that the proposed facility will have no significant effect on dioxin intake either locally or nationally. As shown in data issued by the Federal Ministry for the Environment, Nature and Nuclear Safety (2005) between 1990 and 2005 the dioxins emitted by incinerators in Germany dropped from 400 grams of dioxins per year to less than 0.5 grams. This occurred despite a near doubling of the waste being treated by Germany during the same time period.

Indaver have operated an incinerator in Carranstown, Co. Meath since August 2011. Emissions from that facility are constantly monitored and licensed by the EPA. Dioxin emissions for every year since opening have been a fraction of the licensed limit.

Based on the information available from the literature, from detailed modelling of the proposed development, and from the experience of a similar facility operated by the same company in Ireland since 2011, the human health impact from emissions of dioxins to air is assessed as negligible.

Particulate Matter

Much of the attention on respiratory issues has occurred because of concerns regarding particulate matter or dust. This is despite much lower emissions from modern incinerators than was achievable heretofore. Virtually any development where combustion takes place, and that includes the heating systems and solid fuel or oil boilers for steam generation has the potential to emit particulate matter.

However, none of these other sources are as measured and regulated as incinerators.

Background particulate measurements were performed near Ringaskiddy. These suggest low levels of PM₁₀ and PM_{2.5} in the area. These represent Particulate Matter less than 10 microns and 2.5 microns respectively. To put these numbers into perspective even the finest grain of sand will be in the order of 100 microns in diameter.

As stated previously, in relation to the huge reduction in the amounts of dioxins emitted, the same story is true with regard to particulate matter, or dust, emitted from incinerators. This matter will be dealt with more comprehensively later. The same report referenced above, issued by the German Federal Ministry for Environment, Nature Conservation and Nuclear Safety (2005), in relation to Dioxins also stated that between 1990 and 2001 the particulate matter emitted by incinerators in Germany dropped from 25,000 tonnes of dust per year to 3,000 tonnes.

Air modelling in **Chapter 8 Air Quality** of this document predicts that the contribution from the site in the context of this baseline is minor with levels even under maximum operation remaining significantly below levels which would be expected in urban areas even at the worst-case boundary receptor. Levels at the nearest residential receptor will be minor, with the annual contribution from Indaver and associated traffic will be small. Predicted levels for both PM₁₀ and PM_{2.5} are well below relevant Air Quality Standards. This has also already been well established in Indaver's facility in Meath, with stack emissions averaging approximately 10% of the Legal Limit. The 2018 Annual Environmental Report (Indaver, 2018) for Indaver in Meath showed very low values.

While very small particulates, sometimes called ultrafine particles, cannot be modelled but there is no evidence that the facility will be a significant source. The US EPA (Baldauf, 2015) had a workshop on Ultrafine particles and concluded.

Controlled human exposure studies have shown that exposures to UFPs can cause biologic changes in several cardiovascular pathways, but similar to short-term exposure epidemiological studies, do not yet provide evidence to support the conclusion that UFPs are more toxic than other PM size fraction.

Based on the information available from the literature, from detailed modelling of the proposed development, and from the experience of a similar facility operated by the same company in Ireland since 2011, the human health effects from emissions of particulates to air is assessed as negligible.

Other Air Quality Issues

As has been carried out for dioxins and particulate matter (PM₁₀ and PM_{2.5}), similar baseline assessments and modelling has been carried out for other aspects of air quality. These have included PAHs (Polycyclic Aromatic Hydrocarbons), SO₂ (Sulphur Dioxide), NO₂ (Nitrogen Dioxide) and NO_x, CO (Carbon Monoxide), TOC (assumed in worst case to be solely Benzene), HCl (Hydrochloric Acid) and HF (Hydrofluoric Acid). This is detailed in the **Chapter 8 Air Quality** of this EIAR. All of these predict levels are below Air Quality Standards even at maximum operation in worst case scenario weather conditions. It is reasonable from this to extrapolate no deleterious health effects.

The situation is identical with modelled metals. This included Mercury, Cadmium and Thallium as well as the sum of other relevant metals. Again, the levels predicted are simply not consistent with a detrimental health effect.

Ultrafine particles are sometimes mentioned despite the fact that by far the most important source of these in the air is traffic and specifically diesel-powered vehicles. Emissions of these from the facility given the filters etc, to prevent these are not anticipated to have significant effects.

Again, evidence from the Carranstown Facility, which has been in operation since 2011 has confirmed that this is the case for an existing facility.

Based on the information available from the literature, from detailed modelling of the proposed development, and from the experience of a similar facility operated by the same company in Ireland since 2011, human health impact from emissions to air including the emissions of heavy metals to air is assessed as negligible.

Water

Water quality

As detailed in **Chapter 13, Soils Geology, Hydrogeology, Hydrology and Coastal Recession**, there has been considerable attention given to ensuring that there will be no adverse effect on water quality. Where necessary mitigation measures are put in place to ensure continued supply of high quality and safe drinking water. The vast majority of residences in the area receive their water by mains which will continue to be monitored in the normal way.

No adverse effect on water quality is predicted and therefore there will be no health effect.

Flooding

The design of the construction and operational phase of the proposed project has considered the risk of flooding at every step. The design of the construction and ancillary works will ensure that there is no increased risk of flooding and indeed flood protection measures have been included and therefore there will be no health effect. Refer to **Appendix 13.4 Flood Risk Assessment**.

Soil Contamination

As detailed in **Chapter 13 Soils Geology, Hydrogeology, Hydrology & Coastal Recession** and also below in **Section 6.5.4.3**, no soil contamination is predicted and therefore we can be confident of no adverse effects on human health

Psychological Health

The community will experience minor annoyance from the temporary impacts of the construction phase.

Whilst individual annoyance cannot be discounted, annoyance in itself is not a health effect. There is no evidence that there are any significant effects on human health from simply transient levels of annoyance. In these circumstances the negative impacts are assessed at Slight.

As identified in the methodology section above, concerns are likely in relation to public perceptions in relation to the health effects of the emissions of incinerators. This is likely to be added to by some catastrophisation which can happen in the media. It is also possible that some people opposed to incinerator the actually accentuate this. The actual facts however very different. As outlined above there are minimal adverse health effects attributable to modern well-run incinerator. The best mitigation factor would appear to be information and education. There is no evidence of ongoing psychological effects around incinerators published in literature and indeed no evidence in relation to the other Indaver facility in Carranstown, Co. Meath.

Therefore, the assessment is that while some worries and anxieties are possible in the short to medium-term, these will be minimised by making available appropriate information regarding the proposed facility and its effects and negligible long-term effects are predicted.

Noise

During the construction phase of the project, there will be a slight to moderate short-term effect on nearby noise sensitive properties due to noise emissions from construction works and site traffic.

Due to the distance between the construction works and the nearest sensitive receptors, however, the calculated noise effects are within the relevant criterion set for this phase. This means that there will be no adverse health outcomes.

The assessment has concluded that due to the distance between the proposed development and the nearest sensitive buildings, the proposed site layout and the recommended noise mitigation measures, the facility can operate within the adopted day, evening and night-time noise limit values once operational.

Overall, there will be a long term, not significant noise impact to the nearest noise sensitive locations taking account of the existing noise environment and the predicted effect of the operation of the proposed development. This means that there will be no adverse health outcomes.

6.5.6.2 Health Improvements

There is the potential for a significant opportunity for health improvements associated with the proposed facility. These include the potential for economic development as well as tourism which in itself is associated with an improvement in health status.

The community benefit fund of approximately €240,000 per year has the potential to provide real health improvements. It could help to provide extra opportunities for recreation and exercise as well as health and education facilities. Refer to **Section 6.5.4.5** for more detail.

There is also the potential for improvements in social health with a reduction in unemployment and particularly long-term unemployment. The facility will also provide a resource to support employment in the area but also at National level. Such a potential if realised will bring with it benefits including reduced inequality in society. The residual effect will be positive.

6.5.6.3 Access to Services

There is potential for improvement in access to services and in particular waste management. The proposed facility has the potential to facilitate sustainable disposal of both municipal and industrial waste. In addition the community benefit fund will have the potential to add local amenities. The residual impact will be positive.

6.5.6.4 Conclusions

While some studies, particularly in the past, report health effects in relation to incinerators, nearly all of these studies are, by their nature, historical and refer to toxic or industrial burning processes. These virtually all pre-date modern technology and the associated large decreases in emissions. They also pre-date current regulatory restrictions on allowable emissions such as the EU Air Quality Directive and the EU Industrial Emissions Directive.

We know from direct experience that modern incinerators operate well within these stringent guidelines. The Indaver incinerator in Meath, widely predicted by objectors in advance of its commissioning to greatly exceed those limits, has in operation been a great example of a well-run facility.

Modelling for emissions of particulate matter in the form of PM₁₀ and PM_{2.5} does not support any likelihood of a detrimental health effect.

There has been nothing published in recent literature which would significantly change this position. Overall, there is little evidence to suggest that waste incinerators are associated with the increased respiratory symptoms, or other medical conditions, in the surrounding population. This is consistent with the data from risk assessments, emissions and ambient air monitoring in the vicinity of incinerators, which indicate that modern, well-managed facilities make a very small contribution to background levels of air pollution.

Multiple reputable reviews quoted above support this position.

The fact that the proposed facility will be operated in accordance with the strict terms of the EU Industrial Emissions Directive, means that emissions will be lower than from practically all facilities assessed in publications cited herein, reducing even further any possible risk.

The Annual Environmental Report (Indaver, 2018), the EPA on emissions from the Indaver facility in Carranstown, Co. Meath shows not only are the emissions well within the Legal licensed limit but in many cases a small fraction of those. Dioxins are considerably less than 1% of the legal limit. This shows that in practice as well as in theory modern, well run incinerators, do not pose an environmental risk.

All information available on the Ringaskiddy facility therefore, both from modelling and from actual results of a similar facility in Ireland, indicates that all emissions will be well within the statutory Air Quality Standards. These provide strong evidence that there will be no deleterious effect on human health either in the immediate vicinity or in the wider context, due to its operation.

6.5.6.5 Dioxin Uptake Modelling

General

A soil dioxin and dibenzofuran (PCDD/F) monitoring programme was conducted by AWN Consulting in the Cork Harbour area in 2001 and was repeated in 2008 and in 2015. Dioxin-like polychlorinated biphenols (PCB) were included in the monitoring programme. The full report of the baseline soil monitoring is presented in **Appendix 6.2**.

The dioxin intake model, the RISC Human PCDD/F Intake Model, for the Maximum At Risk Individual (MARI), prepared in 2015 for the planning application, was updated with new baseline data from 2018/2019 and the outputs of the air dispersion model from **Chapter 8 Air Quality** of this EIAR. The full report is presented in **Appendix 6.3**.

The impact of increased short term PCDD/F emissions from accidental fire scenarios was also modelled by BOC. This assessment is included as Appendix 6 to the HAZID in **Appendix 6.1** to this EIAR. Based on worst case assumptions associated with the fire scenarios, the daily intake levels for PCDD/F set by the WHO were not exceeded.

Findings of Soil Monitoring

Soil and sediment sampling was conducted at 12 no. locations in the Cork Harbour Area and at EPA Iniscarra, with the aim of determining background concentrations of PCDD, PCDF and dioxin-like PCBs in the vicinity. Refer to **Appendix 6.2**. Samples were analysed for dioxins and furans with results compared to previous data recorded by AWN and EPA sampling in 2000. The conclusions of the sampling and analysis programme were as follows:

Background concentrations of PCDD/Fs in soil samples were found to be reduced from samples measured at similar locations in 2001 and 2008. The concentration at Martello Tower (Location 3A) continues to be elevated above locations and in this recent round, the total PCDD/F concentration at Roche's Point Lighthouse (Location 7A) was found to be highest with a TEQ of 0.802 ng/kg. Dioxin-like PCB concentrations were typically similar to recorded concentrations in 2008 and remain well below Dutch limit value concentrations.

TEQ PCDD/F concentrations in beach sediment samples were shown to be slightly higher at three out of the four sampling locations in 2015 with the most elevated concentration (0.485 ng/kg) recorded at the strand in Whitegate Village to the east of the site (Beach 1A). PCDD/F concentrations in sediments were still well below EA UK limit values, however. TOC and pH values were within expected ranges with slight alkalinity in the sediment samples as expected in marine conditions.

Heavy metal concentrations were recorded at each of the twelve locations with highest lead (110 mg/kg) and zinc (140 mg/kg) concentrations recorded at Locations 4A and 2A, respectively.

Soil Uptake Modelling Results

Soil sampling and ambient air monitoring data, was used to establish a baseline for PCDD/F (hereafter referred to as 'dioxins and furans') intake for a theoretical Maximum At Risk Individual (MARI) in the vicinity of the proposed Ringaskiddy Waste-to-Energy facility. The report of the soil uptake modelling results is presented in **Appendix 6.3**.

The MARI was assumed to live at the point of maximum dioxin and furan deposition from the proposed development and to be a subsistence farmer, who obtained all their meat, milk and vegetables from a 100m diameter site, upon which the maximum deposition flux impacted.

The annual average dioxin and furan emissions under maximum operating conditions (worst case emissions) and assuming that both municipal solid waste and hazardous waste facilities were operating at maximum permitted dioxin concentration in the flue gas, maximum permitted flue gas exhaust flow rates and maximum throughput, were used to model soil PCDD/F concentrations over the operating life of the facility.

This was a very conservative assumption as it assumed the facility operated 24 hours per day, 365 days per year at the maximum emission concentration and flue gas flow rate.

The modelled soil and air values were then added to the baseline value for dioxin and furans and input to the RISC HUMAN Model.

The predicted increase in dioxin and furan intake for the MARI was estimated to increase by 0.16176 pg WHO-TEQ/kg body weight/wk, to 2.2443 pg WHO-TEQ/kg body weight/wk, an increase of just 1.2% of the EC TWI limit value of 14 pg WHO-TEQ /kg body weight. The TWI was set by the EU in order to protect human health and was based on applying a safety factor to the LOAEL (Lowest Observed Abnormal Effect Levels) for dioxin and furans.

It was therefore concluded that the predicted impact of the emissions from the waste-to-energy facility, even assuming both municipal solid waste and hazardous waste facilities operating at maximum capacity, maximum permitted exhaust flow rates and maximum permitted dioxin and furan concentrations, in terms of dioxin and furan dose to a theoretical MARI, is not significant, with the dioxin and furan dose to the MARI predicted to increase by only 1.2% of the limit value. The facility will have no impact on human health with respect to dioxin and furan intake.

6.5.6.6 Residential Amenity Impacts During Operation

Traffic Aspects in relation to Residential Amenity

It is clear from the extensive consultations which Indaver has carried out with both the local community and the statutory authorities that traffic congestion on the main N28 approaches to Ringaskiddy and to the site, and how this congestion should be managed during the peak hours, is a major concern. The impact of the generated traffic on the local road network is assessed in **Chapter 7 Roads and Traffic** of this EIAR and mitigation measures which Indaver intend to include in their development proposals are investigated where necessary.

With all of the above issues in mind, Indaver has approached the design, construction and operation of the Resource Recovery Centre on the principle of minimising traffic at peak periods where possible.

During construction, the morning construction traffic will be scheduled to coincide with the lower traffic flows between 06:00 - 07:00, the higher traffic flows which occur later are avoided, as discussed in **Section 7.10.3 of Chapter 7**.

During operation, Indaver will minimise traffic at peak periods through the implementation of a HGV booking system, and the arrangement of operational personnel shifts and visitor traffic so that the facility generates minimal traffic on the local road network during the peak traffic periods once operational. These initiatives are similar to those developed at the Port of Cork as part of their approach to management of traffic flow at peak times. Furthermore, a robust staff Mobility Management Plan, will ensure that there are no staff movements to or from the facility for two-hour periods in the morning and evening by car, while HGV movements will also be reduced to a minimum level during these times. Further details are provided in **Chapter 7 Road and Traffic** of this EIAR.

Indaver is aware of the concern expressed by the community at the public meetings in relation to the provision of enhanced active mode travel facilities including improved footpaths, cycle facilities and controlled safe road crossing points. Indaver understands that the local authority are developing proposals for the provision of improved cycle facilities as part of the Cork Cycle Network and recent improvements have been made to the junction at Shannon Park and also a pedestrian crossing facility in the village of Ringaskiddy.

Residential Amenity– Other Aspects

The proposed Resource Recovery Centre will not involve any activities or processes completely new to the Ringaskiddy area. The proposed development will be located beside a Hammond Lane which handles scrap steel for recycling.

The off-loading of liquid wastes from tankers in the waste-to-energy facility will be a similar activity and on a similar scale to the off-loading and loading of solvent tankers in the pharmaceutical facilities. In most of these facilities, total waste management is handled by specialist waste contractors and brokerages, for shipment overseas.

Currently, two of the pharmaceutical facilities in the Ringaskiddy area operate incinerators which are licensed by the EPA, and which treat hazardous and non-hazardous waste generated on site. The proposed Waste-to-Energy facility will be larger in scale than the existing incinerators but will use combustion technology to treat the waste.

The tipping hall and bunker will be under negative pressure to prevent odours from the facility impacting on local residents. There will not be a significant impact from odours resulting from the proposed development.

Trucks carrying solid waste to the facility will be enclosed or covered to prevent litter escaping and the waste tipping floor will be enclosed. Litter will not escape to cause a nuisance to residents.

The ongoing effects of the operations of the facility due to the traffic generated, emissions to the atmosphere and noise are discussed in **Chapters 7 Roads and Traffic, 8 Air Quality and 10 Noise and Vibration** of this EIAR, respectively.

The effects on landscape is assessed in **Chapter 11 Landscape and Visual Assessment** of this EIAR. There are not expected to be any other effects on residential amenity.

6.5.6.7 Community Benefit Fund

Under Condition 19 of the 2018 An Bord Pleanála Board Order (04PA0045) regarding the grant of planning for the 2016 planning application states the following:

“19. A community gain fund shall be established to support facilities and services which would be of benefit to the community in the general catchment area. This fund shall include an annual contribution of €1 per tonne of waste accepted at the Waste to Energy facility, which shall be lodged in a special community fund account. Details of the management and operation of the community gain fund shall be submitted to, and agreed in writing with, the planning authority prior to commencement of development. In default of agreement, the details shall be determined by An Bord Pleanála.

Reason: It is considered reasonable that the operators of the waste to energy facility should contribute towards the cost of environmental, recreational or community facilities which will be of benefit to the community in the area”

Condition 18 states the following:

“18. A Community Liaison Committee shall be established to liaise between the developer, the planning authority and the local community. The committee shall comprise seven members having an independent chairperson, two local community representatives, two elected members of the planning authority, one official of the planning authority and one representative from the developer. The community liaison committee shall:

(a) act as a liaison committee with the local community in relation to ongoing monitoring of the construction and operation of the facility, and

(b) have responsibility for the distribution of the community gain fund account to be set up in accordance with condition number 19 of this order and for decisions on projects to be supported by the fund”

Reason: To provide for appropriate on-going review of construction and operation of the facility in conjunction with the local community and to provide for the allocation of resources from the community gain fund in accordance with the requirements of the local community”.

The local community will benefit from the distribution of this fund annually for local projects including new facilities and upgrades to existing facilities.

The existing Indaver facility in Meath contributes to a Community Benefit Fund as part of the planning conditions of that facility. The Meath fund is administered by the Indaver Community Liaison Committee, which was established in 2009 prior to the main construction works period.

The Committee in Meath is made up of two representatives from the local resident’s association, two local area councillors, two members of Indaver and two members of the local authority, who also act as administrators of the fund.

In Ringaskiddy, it is estimated that the fund will be approximately €240,000 per year for the life of the facility. So far in Meath, the fund has amounted to over €2,000,000 which has been invested in a range of important projects and community initiatives, such as:

- the construction and lighting of a new safe footpath,
- financing the construction of a school building, and
- supporting local cultural, community, arts and sports groups/clubs.

6.5.6.8 Recreational Amenity Effects

Coastal Protection Works

As detailed previously, shingle will be placed at the toe of the glacial till face on Gobby Beach which forms the eastern boundary of the site during the construction period. The works will extend along the beach from near the car park at the northern end of the Indaver site to the southern boundary of the Indaver site. The material will be deposited above the high-water mark. This is discussed further in **Chapter 13 Soils, Geology, Hydrogeology, Hydrology and Coastal Recession**.

The placement of the sacrificial beach material (shingle) required for the coastal protection works will take approximately three weeks to complete. It is envisaged that the first instalment of the shingle will be undertaken towards the end of the construction phase.

The imported shingle will be transported by road and temporarily deposited at the car park at Gobby Beach. A bulldozer will be used to spread the imported shingle in the designated area. It is anticipated that access for construction machinery across the beach will be facilitated by laying down temporary tracks.

To ensure the safety of the general public, it is envisaged that the area of the beach, in which the construction works will take place and the area of the car park in which the materials will be stored, and which will be used by the machinery, will be closed to the public for the duration of the proposed works, approximately three weeks. However, access to the rest of the beach will be maintained for the duration of the works.

The sacrificial material has been designed to remain on site and help lower the natural erosion rate over a number of years. However, the expected duration of the material cannot be determined since it depends on the occurrence of extreme wave events which are impossible to forecast. Therefore, it is anticipated that monitoring of the sacrificial material and the cliff face will take place on an annual basis. Replenishment of the material will be carried out as determined by the monitoring results.

It is envisaged that replenishment may be required every two to five years, but it depends on the duration of the material remaining on site. The impacts described above for the initial instalment of shingle will be repeated during replenishment.

The operation of the proposed development will not encroach on the shoreline amenity. However, due to the close proximity of the truck traffic on the internal roads of the proposed development and the presence of the large building, the shoreline will be more subject to traffic noise and will have a more industrial

ambience than it does currently. Similarly, the amenity of the L2545 road on the northern side of the facility will be reduced as the site frontage will have a greater industrial ambience, even with the proposed planting and screening. A public amenity footpath will be provided on the eastern and southern sides of the site, from the boundary near the shoreline to the southern site boundary close to the Martello Tower. The recreational amenity for boat traffic in the West Channel will be slightly reduced as the site will have a more industrial ambience than it has currently.

The impact on landscape is assessed in **Chapter 11 *Landscape and Visual*** of this EIAR. There are not expected to be any other impacts on recreational amenity.

6.5.6.9 Community Facilities

It is expected that some of the 63 direct jobs, and a number of indirect jobs, will be taken up by people moving to live in the area. There will be a consequent slight increase in demand for community facilities. As detailed previously, up to 320 people will be directly employed during the construction phase. These jobs will be a beneficial economic impact of the proposed development. Local community projects including new facilities and upgrades to existing facilities will benefit from the community fund. See **Section 6.5.4.5** above for details on the community benefit fund.

6.5.6.10 Land Use

The proposed development constitutes a standalone industrial use on a site designated for a standalone industrial development. The proposed development complies with the zoning objective for the site. Adequate landscaped buffers are proposed as appropriate.

Currently most of the site is unused. No economic activity will be displaced by constructing the proposed Resource Recovery Centre on the site. Land use and land take is discussed further in **Chapter 15 *Material Assets***.

6.5.6.11 Agriculture

The emissions to atmosphere from the facility, which are detailed in **Chapter 8 *Air Quality*** of this EIAR, will be extremely low with no adverse effects on the environment envisaged. In particular, based on the monitoring of emissions from Indaver's Waste-to-Energy facility in Co Meath and its other facilities, the emissions of dioxins will be well below the EU Directive limit.

There will be no significant effects on farming activities in the Ringaskiddy area or in the region surrounding the Lower Harbour. In an area, to which the incineration of municipal solid waste is a new activity (two of the existing pharmaceutical facilities in the Ringaskiddy area operate incinerators which are licensed by the EPA), there may be a public perception of a risk to human health and a risk of contamination of farm produce from dioxins in the emissions.

There is no evidence of food companies or outlets boycotting food produce from locations close to modern incineration facilities, such as the Indaver facility in Co Meath. There have been incinerators in the Ringaskiddy area for many years.

The soil dioxin surveys showed that dioxin levels in the soils around the Lower Harbour were below the German target level and well below the level at which crop restrictions would be imposed in Germany. This situation will not change because of the operation of the proposed development.

6.5.6.12 Tourism

As set out in **Section 6.3.4.1** above, Fáilte Ireland published guidelines on the treatment of tourism in an Environmental Impact Statement, in 2011.

Ringaskiddy is not currently a popular tourist destination, but certain sites of value to local tourism in proximity to the Resource Recovery Centre have been identified as potentially being impacted by the Resource Recovery Centre development. These sites are the Ringaskiddy port, Gobby Beach, the Martello Tower and Spike Island. In accordance with Fáilte Ireland EIAR Guidelines the potential impacts of the resource recovery facility have been appraised for these locations.

The potential effects of the Resource Recovery Centre on the visual, biodiversity and cultural heritage have been appraised in **Chapters 11 Landscape and Visual Assessment, 12 Biodiversity** and **14 Archaeological, Architectural & Cultural Heritage** of this EIAR respectively.

Ringaskiddy Port

For tourists using Ringaskiddy Port for the cruise ships or ferry terminal, the Resource Recovery Centre will appear as another industrial facility in the area, refer to **Chapter 11 Landscape and Visual Assessment**. The potential effects of the resource recovery facility on the port in relation to traffic has been appraised in **Chapter 7 Roads and Traffic** of this EIAR.

Gobby Beach

To ensure the safety of the general public, it is envisaged that the area of the beach, in which the construction works (placement of shingle(sacrificial material) will taking place and the area of the car park in which the materials will be stored, and which will be used by the machinery, will be closed to the public for the duration of the proposed works. However, access to other sections of the beach will be maintained for the duration of the works. The duration of the works is expected to be approximately three weeks.

The traffic impacts associated with this construction activity will be minor and are addressed in **Chapter 7**. In addition, the shingle will be replenished as required in the future but it is unlikely to be required on a frequent basis. It is envisaged that replenishment may be required every two to five years, but it depends on the duration of the material remaining on site. Further details are provided in **Chapter 13 Soils, Geology, Hydrogeology, Hydrology and Coastal Recession** of this EIAR. The effects experienced for the initial instalment of shingle will be repeated during replenishment.

In addition, during the L2545 works, Gobby Beach car park may need to be closed for up to six weeks to facilitate the construction works. However, access to the beach will be maintained for the duration of the works.

L2545 Road Upgrade Works

The L2545 upgrade will reduce flood risk on the road which will be of benefit both to the Ringaskiddy Resource Recovery Centre and also to the other existing users of this road including Beaufort, NMCI, the crematorium on Rocky Island and the Naval Base on Haulbowline Island. Future development of Haulbowline as a public park will also benefit due to the improved upgrade of the L2545. The proposed landscaping along the L2545 will improve the approach to Gobby Beach.

Martello Tower

A new bitumen macadam footpath will be constructed to give access from Gobby Beach to the Martello Tower. It is proposed to run along the eastern edge of the site and will be fenced with a low timber fence along the eastern edge. A viewing area will be provided at the higher south east corner of the site providing expansive views over Cork harbour, Spike Island and Cobh.

The development has been sensitively designed in relation to the Martello Tower protected structure in order to retain its prominence when viewed from around the harbour. The main process building is situated at a distance from the tower and aligned to have its narrowest part face the tower. The development does not block views of the tower from most viewpoints around the harbour. The building has been set down as far as possible into the ridgeline and appears to be at a similar or lower height than the Martello Tower from most viewpoints. The stack does however extend well above the height of the tower although it is set at a distance from it, and the vertical form of the existing wind turbines and electricity pylons rise higher than the tower and are situated directly adjacent to it. Refer to **Chapter 11 Landscape and Visual Assessment** for and **Chapter 14 Archaeological, Architectural & Cultural Heritage** of this EIAR further details.

Spike Island

The lower harbour area is currently and will continue to undergo process of change in its visual and landscape character in the short, medium and long term with the other planned and permitted developments in the area including the permitted Novartis wind turbine, M28 Cork to Ringaskiddy Motorway Scheme, redevelopment of the Ringaskiddy Port, Haulbowline and Spike Islands and continued development of other industrial, renewable energy and pharmaceutical projects in the lower harbour area.

The cumulative effect of these developments on the landscape character will be negative in the short term but is deemed to be positive in the medium to long term once operational as the area transitions from a slightly unkempt, semi-industrial area, to a more developed cluster of industry, energy and education campus style landscape. The proposed development will be seen in many ways as an extension of this landscape. Overall the greater surrounding area is deemed capable of absorbing the development without changing the character of Cork Harbour landscape.

As such, it is considered that the Ringaskiddy Resource Recovery Centre is compatible with the plans for greater tourist amenities in the Lower Harbour, such as is envisaged by the Spike Island master plan.

6.5.6.13 Economic Benefit

When the proposed development becomes operational, it is anticipated that 63 people will be employed at the facility. It is estimated that the employment provided will contribute positively to the economy of the South Cork area. The proposed Resource Recovery Centre will also generate annual expenditure on maintenance, security, insurance and various other services, which will be from local suppliers where possible. The employees at the facility may frequent the shops and pubs in Ringaskiddy village, thus adding to the general economic activity in the village. See previous section also in relation to Community Benefit Fund.

Assuming that Indaver's experience in Meath is indicative, the centre will be a niche point of interest for the area. The Cork facility will attract a specific category of visitors to Ringaskiddy annually. The Meath site attracted visitors even as it was being built. During construction, Indaver provided a visitor room and viewing platform for interest groups and stakeholders. Since the opening of the facility in 2011, visitors have been accommodated in a visitor centre in the main administrative building. To date, more than 3,000 local, national and international visitors have come to the Meath facility. Visitors include local and national secondary schools; Irish and international third-level institutions, specifically from renewable energy, engineering, and sciences fields; local authorities, municipalities, and elected officials from Ireland and abroad; national and international industry groups, waste-to-energy operators, and energy bodies; and local, national, and international media including TV, radio, and print journalists. The visitors have come from a range of different countries, including the U.S.A., Belgium, Finland, and the Netherlands.

As Indaver is committed to education and research, it is proposed that the facility in Ringaskiddy will have a visitor centre (located in the administration building) similar to the one in Meath. It will act as a gateway to the site and will showcase best practice in resource recovery management and sustainability.

6.5.6.14 Shellfish Production, Fishing and Angling

The proposed Resource Recovery Centre will not discharge effluent to Cork Harbour and therefore will not impact on water quality in the designated shellfish growing area.

The upgraded surface water drainage system in the L2545 road will discharge to Cork Harbour via a Class 1 hydrocarbon bypass interceptor and via the existing 450mm surface water outfall at Gobby Beach. There will be no impact on the water quality of Cork Harbour as a result of the road drainage system.

The sacrificial material will be placed above the high tide level and will not impact on water quality.

The proposed development will not have a significant effect on shellfish production, fishing or angling in Cork Harbour.

6.6 Mitigation and Monitoring Measures

The health and safety features incorporated into the design of the proposed facility are outlined in **Chapter 4 Description of the Proposed Development** of

this EIAR. The health and safety policy, procedures and work practices of the proposed development will conform to all relevant health and safety legislation both during the construction and operational stages of the proposed Resource Recovery Centre. The proposed development will be designed and constructed to best industry standards, with an emphasis being placed on the health and safety of employees, local residents and the community at large. The technology to be employed in the proposed development is well understood and has been used successfully in equivalent projects internationally, with no implications for health and safety. The characteristics of the proposed development are presented in **Chapter 4 Description of the Proposed Development** of this EIAR and in the drawings submitted with the 2016 planning application. Refer also to **Chapter 16 Major Accidents and Disasters** for further details.

Many of the mitigation measures described elsewhere, such as in relation to emissions to air and noise will have the effect of mitigating any effects on human health. In addition, to minimise any potential psychological effects in relation to worry about human health effects, even though the overwhelming evidence is that there are none, ongoing information and education of the community will be made available. This may be facilitated by information and performance of the facility and emissions being available on a website for the public to review. Seeing the real values will likely reassure reasonable persons.

To minimise the risk that the proposed development will cause nuisance, comprehensive mitigation measures will be implemented, during both the construction and operational phases of the development. These mitigation measures will reduce any significant negative impacts of the proposed development on the residential amenity of the local area. Refer to the following EIAR Chapters for further details of mitigation measures:

**Chapter 5 Construction Activities, Chapter 7 Roads and Traffic,
Chapter 8 Air Quality, Chapter 9 Climate, Chapter 10 Noise and Vibration,
Chapter 11 Landscape and Visual, Chapter 12 Biodiversity,
Chapter 13 Soils, Geology, Hydrogeology, Hydrology & Coastal Recession,
Chapter 14 Archaeology, Architectural and Cultural Heritage,
Chapter 15 Material Assets and Chapter 16 Major Accidents and Disasters.**

6.7 Cumulative Effects

Following a review of the committed projects and the planning files for Cork County Council and An Bord Pleanála, the cumulative effects of the proposed development on population and human health with the following have been assessed:

Proposed Projects:

- M28 Cork to Ringaskiddy Motorway Scheme – Under judicial review. Timeline unknown, construction estimated 30-36 months;
- Potential local projects associated with the proposed Indaver Community Benefit Fund; and

- Other planned/permitted projects include the following (note: the construction/operation timelines of these projects are currently unknown):
 - BioMarin - (PA No. 186603) extension to manufacturing building;
 - GE Healthcare Life Science BioPark – (PL04 .248154) – planning granted. To be located in Barnahely;
 - Pfizer Ireland - PA Ref 16/6937: Granted in Jan 2017; and
 - Novartis – Number of permitted projects including the permitted wind turbine (planning for turbine expires November 2022).

Existing Projects

- Hammond Lane Metal Company Ltd. – now operating under a IE licence P0997-01. No further planned expansion;
- Four wind turbines –Including the second De Puy 3MW turbine which has been operational since 2018. No information available on construction timeline of the permitted Novartis turbine;
- The National Maritime College of Ireland (NMCI);
- UCC ERI Beaufort Building;
- The Island Crematorium;
- Haulbowline Island Recreational Park – Remediation of the former East Tip is complete, and the park is due to be open to the public in 2019;
- Ispat Steelworks Site, Haulbowline Island – Remediation works likely in the future, but timeline known.
- Irish Naval Service base, Haulbowline Island;
- Spike Island – New masterplan is currently being prepared;
- Port of Cork – redevelopment due to be complete in 2020;
- Cork Lower Harbour Drainage Scheme – WwTP complete, other associated upgrade works (pump stations, pipelines) ongoing in the area and due to be complete in 2019;
- Residential Developments - No known planned/permitted projects;
- ESB Aghada Power Station;
- Bord Gais Power Station at Whitegate;
- Amenity developments in Ringaskiddy;
- Ferry and Cruise Ship Business;
- Local projects associated with the proposed Indaver Community Benefit Fund; and
- Pharmaceutical and Medical Device Manufacturers.

No projects or plans other than those listed in this chapter were identified as having potential cumulative effects.

The upgrade to the L2545 proposed as part of the development will be of benefit for all road users, including those who wish to access Haulbowline Island and the crematorium on Rocky Island. It is understood that a community benefit fund was conditioned as part of the Port of Cork redevelopment. This community benefit fund in combination with the fund conditioned as part of this proposed development (See Condition 18 and 19 of planning permission) will be of considerable benefit for the local Ringaskiddy community and surrounds in the development of local projects.

It is not considered that there will be any negative cumulative effects on population and human health. The distances between the projects noted above and the proposed development results in no cumulative noise or air quality effects.

Refer to **Chapter 17 Cumulative Effects, Other Effects and Interactions**, for a detailed description of each project/development listed above.

6.8 Residual Effects

The proposed mitigation measures will either avoid, prevent or reduce effects to human beings during the construction and operation phases of the proposed development.

From health protection terms strong evidence is that there will be no deleterious effects. Mainly as a result of a misunderstanding of the health effects of modern well-run incinerators it is acknowledged that some public anxiety might remain, but this will be mitigated by an education program and no long-term adverse health effects are predicted.

The potential economic benefits both direct from employment in the facility itself and indirect from positive effects on other sources of employment has potential to give positive health effects

It is considered that there will be a minor residual effect on the recreational amenity of the site and its immediate vicinity as the site will have somewhat more of an industrial character than it does at present. However, the industrial context is in keeping with its location within a Strategic Economic Area, as discussed in **Section 2.4.3 of Chapter 2 Policy and Planning Framework and the Need for the Scheme**. The Ballincollig Carrigaline Municipal District Local Area Plan 2017 was amended and adopted on 21 August 2017. The Plan has rezoned the principal part of the proposed development site from I-15 to RY-I-20 with the following specific objective:

“Suitable for the extension of the opposite Third Level Educational campus and enterprise related development including marine related education, enterprise, research and development. [...]”

Notwithstanding the above, the provision of a strategic large-scale waste treatment facility at the project site in Ringaskiddy, which is both an Industrial Area and Strategic Employment Area, is endorsed by **Section 6.4.11** of the Cork County Development Plan 2014 (CDP) and is in accordance with policies for its zoning objective, as discussed in **Chapter 2 Policy and Planning Framework and Need for the Scheme**. In addition, the proposed development was granted planning permission by An Bord Pleanála in May 2018.

The jobs created during construction and operation, and the contribution which Indaver and its employees will make to the local economy, will have a slight positive economic impact on the Ringaskiddy and Cork City and County areas.

Furthermore, a community benefit fund will be set up as required by Conditions 18 and 19 of the May 2018 An Bord Pleanála Board Order (04PA0045) regarding the grant of planning for the 2016 planning application. In Ringaskiddy, it is estimated that the fund will be approximately €240,000 per year for the life of the facility. This considerable sum of money on an ongoing basis for the community has major potential to provide improved access to services and health improvements.

As no adverse effect is predicted in terms of health protection, and potentially positive effects are predicted in terms of access to services and health improvements the overall residual effect on human health of the project is assessed as being positive.

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