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Project

# Stage One Screening Report and Stage Two Natura Impact Statement for a proposed Ringaskiddy Resource Recovery Centre and associated works at Ringaskiddy, Co. Cork

Client

| Project ref | Report no | Client ref | |
|---|---|---|---|
| 1538 | 1538 | Indaver | |

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## 1. Introduction

Indaver proposes to develop a Resource Recovery Centre (including waste-to-energy facility) in Ringaskiddy in County Cork.

The proposed development will consist principally of a waste-to-energy facility (waste incinerator with energy recovery) for the treatment of up to 240,000 tonnes per annum of residual, household, commercial and industrial, non-hazardous and hazardous waste which is currently landfilled or exported. 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 line with European Union and national policy, this residual waste will be diverted away from landfill and exports, moving the management of waste up the waste hierarchy, allowing Ireland to become more self-sufficient in the treatment of waste and reducing the environmental impact of residual waste management. The proposed development will maximise the extraction and recovery of valuable material (in the form of ferrous and non ferrous metals) and energy (in the form of 21 megawatts of electricity) resources from residual waste.

In 2008, Indaver submitted an application for permission under section 37E for a waste-to-energy facility at Ringaskiddy, Co. Cork directly to An Bord Pleanála for its approval (*Indaver Ireland Ringaskiddy Waste–to-Energy Facility Environmental Impact Statement, November 2008*). An oral hearing on the application was held in 2009.

An additional report (*Appropriate Assessment of the Potential Impacts on the Cork Harbour SPA, ARUP 2009*) was prepared in response to queries raised during the oral hearing.

Subsequently, An Bord Pleanála requested further information on the proposed development in January 2010. This included modifications to the scheme, works to prevent flooding of the public road accessing the Indaver site and works to protect the coastal boundary of the Indaver site. The further information was provided to the Board as an addendum to the 2008 EIS (*Indaver Ireland Ringaskiddy Waste–to-Energy Facility Addendum to 2008 EIS, August 2010).*

As part of the response to the request for additional information an additional report *(Appropriate Assessment screening report for proposed modifications to a Waste to Energy Facility and Transfer station, road upgrade works and coastal protection works at Ringaskiddy, Co. Cork, DixonBrosnan, 2010*) was prepared and submitted to the Board. Ultimately, the Board decided to refuse permission under the application submitted in 2008. However, the conclusion from the competent authority was that there would be no significant impacts on the SPA from the proposed development.

Indaver has decided to apply to the Board for permission for a development on the site. This NIS was prepared in support of this latest application. The above mentioned reports were consulted during the preparation of this document.

Accordingly, this Stage One Screening Report and Natura Impact Statement for Appropriate Assessment comprises a compilation of the information relevant to the competent authority's assessments relating to the potential significant impacts of the proposed Indaver Ringaskiddy Resource Recovery Centre on Natura 2000 sites within the surrounding area. The Environmental Impact Statement [EIS], which has been prepared for this proposed development and submitted with the application for permission under section 37E, provides much of the detail upon which this NIS is based, particularly in relation to the receiving environment and baseline ecology. Thus, this NIS contains reference to the information set out in considerable detail in the EIS. Where relevant, reference is also made to the previous reports prepared for this site.

## 2. Regulatory Context and the Appropriate Assessment Procedure

### 2.1 Regulatory context

Article 6(3) of *Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora* (as amended) (hereafter 'the Habitats Directive') requires that, any plan or project not directly connected with or necessary to the management of a designated site, but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. For the purposes of the application for permission in respect of the proposed Ringaskiddy Resource Recovery Centre development, the requirements of Article 6(3) have been transposed into Irish law by Part XAB of the Planning and Development Act 2000, as amended.

The possibility of there being a significant effect on a designated or "European" site will generate the need for an appropriate assessment to be carried out by the competent authority for the purposes of Article 6(3). In this instance, the competent authority is An Bord Pleanála. As set out in Section 177U of the Planning and Development Act 2000 as amended, a screening for appropriate assessment of an application for consent for the proposed development must be carried out by the competent authority (in this case, An Bord Pleanála) to assess, in view of best scientific knowledge, if the proposed development, individually or in combination with another plan or project is likely to have a significant effect on any European site. A Stage Two Appropriate Assessment is required if it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site. The first (Screening) Stage for appropriate assessment operates merely to determine whether a (Stage Two) Appropriate Assessment must be undertaken on the implications of the plan or project for the conservation objectives of relevant European sites.

### 2.2 Appropriate Assessment Procedure

The assessment requirements of Article 6(3) establish a stage-by-stage approach.This assessment follows the stages outlined in the 2001 European Commission publications "*Assessment of plans and projects significantly affecting Natura 2000 sites: methodological guidance on the provisions of Articles 6(3) and 6(4) of the Habitats Directive 92/43/EEC"* (2001) and *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Draft)* Office for Official Publications of the European Communities, Luxembourg (EC, 2015);

The stages are as follows:

*Stage One: Screening* — the process which identifies any appreciable impacts upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant;

*Stage Two: Appropriate assessment* — the consideration of the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts;

*Stage Three: Assessment of alternative solutions:*The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site. It is confirmed that no reliance is placed by the developer on Stage Three in the context of this application for development consent;

*Stage Four: Assessment where no alternative solutions exist and where adverse impacts remain* — an assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed (it is important to note that this guidance does not deal with the assessment of imperative reasons of overriding public interest). Again, for the avoidance of doubt, it is confirmed that no reliance is placed by the developer on Stage Four in the context of this application for development consent

Documentation/guidelines of relevance to this NIS include the following:

- European Commission, 2001. *Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC.* Office for Official Publications of the European Communities, Brussels (EC, 2001);
- European Commission, 2000a. *Communication from the Commission on the Precautionary Principle.*, Office for Official Publications of the European Communities, Luxembourg (EC, 2000a);
- *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Draft)* Office for Official Publications of the European Communities, Luxembourg (EC, 2015);
- *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EC, 2000)*
- Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission; (EC, 2007);
- *Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government, Dublin (DEHLG, 2010a);
- Department of Environment Heritage and Local Government Circular NPW 1/10 and PSSP 2/10 on Appropriate Assessment under Article 6 of the Habitats Directive – Guidance for Planning Authorities (DEHLG, 2010b);
- European Commission Staff Working Document '*Integrating biodiversity and nature protection into port development'* (EC, 2011b);
- *Interpretation Manual of European Union Habitats. Version EUR 28*. European Commission (EC, 2013);
- Applications for approval for Local Authority Developments made to An Bord Pleanála under 177AE of the Planning and Development Act, 2000, as amended (Appropriate Assessment): Guidelines for Local Authorities. An Bord Pleanála, Dublin (ABP, 2013).

## 3. Methodology

### 3.1 Study Area and Scope of Appraisal

In line with the precautionary principle, the study area for the preparation of this Stage One Screening Report and Natura Impact Statement extended to a radius of 20km from the applicant's site boundary. Thus any appreciable direct, indirect or cumulative impacts which could arise from the proposed development in relation to the designated sites within this zone were considered. No potential ecological risks to designated sites outside this 20km

radius were identified. It is noted that local potential ecological impacts within the development site itself, which is not designated as a European site, are considered in detail by **Chapter 12 *(Biodiversity)*** of the EIS. The location of the site is shown in **Appendix 1, Figure 1,** and an overview of the proposed development is provided in **Appendix 1, Figure 2**

### 3.2 Desktop Study

A desktop review facilitates the identification of the baseline ecological conditions and key ecological issues relating to Natura 2000 sites and facilitates an evaluation assessment of potential in-combination impacts. Sources of information used for this NIS include previous reports prepared for the Indaver site, information from statutory and non-statutory bodies and information from other projects in the Cork Harbour area. The sources of information and relevant documentation utilised are as follows:

***Information on the Indaver Site***

- Indaver Ringaskiddy Resource Recovery Centre Environmental Impact Statement, 2015
- Indaver Ringaskiddy Waste–to-Energy Facility Environmental Impact Statement, November 2008
- Appropriate Assessment of the Potential Impacts of the Ringaskiddy Waste-To-Energy facility on the Cork Harbour SPA, ARUP 2009
- Indaver Ireland Ringaskiddy Waste–to-Energy Facility Addendum to 2008 EIS, August 2010
- Appropriate Assessment screening report for proposed modifications to a Waste to Energy Facility and Transfer station, road upgrade works and coastal protection works at Ringaskiddy, Co. Cork, DixonBrosnan, 2010

***Information from statutory and non-statutory bodies***

- National Parks & Wildlife Service (NPWS) - www.npws.ie including qualifying interests and conservation objectives for Natura 2000 sites.
- Environmental Protection Agency (EPA) – www.epa.ie
- National Biodiversity Data Centre – www.biodiversityireland.ie
- County Cork Biodiversity Action Plan 2009 2014 (Cork County Council, 2009);
- OPW Draft Guidance on the Assessment of potential future scenarios for Flood Risk Management

***Other plans and projects***

- Ringaskiddy Port Redevelopment EIS (Port of Cork/RPS, 2014)
- Ringaskiddy Port Redevelopment. Further Information in accordance with Section 37F [1] Revised Screening for Appropriate Assessment (Port of Cork/RPS, 2015)
- IMERC Masterplan A Masterplan for the Irish Maritime and Energy Resource Cluster
- Spike Island Masterplan Spike Island
- Port of Cork Monkstown Marina Proposals
- East Tip Remediation Project, Haulbowline Island

- Hammond Lane Metal Cork
- Cork Lower Harbour Energy Group Wind Turbines
- N28 Road Upgrade
- Cork Lower Harbour Main Drainage Scheme sewage treatment plant, Shanbally

### 3.3. Consultation

Prior to the submission of the application for permission to the Board, meetings were held with Dr. Jervis Good and Danny O'Keefe (National Parks and Wildlife Service) on May 27, 2015, and September 9, 2015. At the meetings, the issues to be addressed in the NIS were discussed. A letter from the Development Applications Unit (DAU) of the Department of Arts, Heritage and the Gaeltacht, dated 11 September 2015, set out the heritage related observations/recommendations of the Department (**Appendix 2**). This information is provided in various sections within the NIS as follows:

- Effects of air emissions (Point 1 of DAU letter) and dioxins and furans (Point 2 of DAU letter) are primarily addressed by assessing the available data as presented by a literature review on the potential ecological effects of mercury, dioxins, thalium and cadmium on bird receptors and otter (**Appendix 3**)
- Bird collision risk (Point 6 of DAU letter). This is addressed by a literature review on the risk of bird collisions with the proposed stack taking into account recent developments in Cork Harbour. (**Appendix 4**)
- Assessment of potential bio-monitoring programme (Requested at the NPWS meeting, May 2015). (**Appendix 5**)
- Flue gas treatment residue and filter ash transport in Cork Harbour (Point 4 of DAU letter and flue gas treatment residue and filter transport in the Elbe Estuary (Point 5 of DAU letter). This is addressed by **Section 4.5.8** of this report.
- Increased predator attraction (Point 7 of DAU letter). This is addressed by **Section 4.5.10** of this report.
- Further information on the potential for accidental releases, both onsite and offsite, with a particular emphasis on risks associated with shipping of residues overseas for recovery or disposal. (**Section 4.5.8 ).**
- Trans-boundary effects, including flue gas cleaning residues disposal in salt mines or landfill, in Europe. (**Section 4.5.9**)
- Information on air emission monitoring data from Indaver's plant at Carranstown, Co Meath. (Requested at the NPWS meeting, May 2015). (**Appendix 6**).
- Comparative data from similar waste-to-energy incinerator facilities (Point 3 of DAU letter). This information is provided in (**Appendix 6**).
- Effects of hazardous compounds (Point 8 of DAU letter). This is addressed in **Appendix 6.**
- Information on plant start-up and shut-down procedures including frequency of start-up and shut-down, and emergency response procedures (Requested at the NPWS meeting, May 2015). (**Appendix 6**)

### 3.4 Relevant information

Information on the project which was used to assess potential impacts is included in the appendices as follows. This information, where relevant, is summarised in the text of this report.

**Introduction to the project (Appendix 7) and Proposed site and project description (Appendix 8).**

These provide an overview of the proposed development and a description of the proposed site and the Ringaskiddy Resource Recovery Centre development.

**Construction Activities (Appendix 9)**

This appendix describes the construction operations and phasing for the proposed Ringaskiddy Resource Recovery Centre and outlines the measures to be taken to ensure the impact of the construction activities on the environment is minimised.

**Biodiversity (Appendix 10)**

Provides a comprehensive assessment of the impacts on ecology based on desktop studies and field surveys. In addition to surveys previously carried out at the site, the following surveys were also carried out in 2014/2015: habitat mapping , surveys of wintering birds, breeding birds surveys, common tern breeding survey, mammals, with a particular emphasis on badger, otter and bats and intertidal survey.

**Air (Appendix 11)**

Provides a detailed appraisal of potential impacts on air which could arise from emissions generated during construction works or from emissions during operation. The scope of the study consists of the following components:

- Review of maximum emission levels and other relevant information needed for the modelling study;
- Identification of the significant substances which are released from the facility;
- Review of background ambient air quality in the vicinity of the facility;
- Air dispersion modelling of significant substances released from the facility;
- Particulate deposition modelling of Dioxins & Furans, Polycyclic Aromatic Hydrocarbons (PAHs) and heavy metals released from the facility;
- Identification of predicted ground level concentrations of released substances at the facility boundary and at sensitive receptors in the immediate environment;
- Evaluation of the significance of these predicted concentrations, including consideration of whether these ground level concentrations are likely to exceed the most stringent ambient air quality standards and guidelines.

**Noise and vibration (Appendix 12)**

Provides an assessment of the potential noise and vibration impacts on the surrounding environment associated with the construction and operation of the proposed facility. As the proposed development is located 0.5km from the closest Natura 2000 site (Cork Harbour SPA) the risk of significant impacts is considered very unlikely. However as there could potentially be impacts on birds listed as qualifying interests for this SPA, where they occur outside the site boundary, noise and vibration is considered relevant. The conclusions of this appendix are included in text of this report.

**Appendix 13**

Hazard Identification and Risk Assessment Report

**Sampling And Analysis Of Soil And Sediment Samples (Appendix 14)**

Sampling And Analysis Of Soil And Sediment Samples For PCDDs, PCDFs And PCBs At Various Locations Around Cork Harbour.

**Appendix 15**

Ecological Risk Assessment for PCDD/F for Indaver Ringaskiddy Resource Recovery Centre.

### 3.5 Author of Report for Screening and Appropriate Assessment

This report for screening and NIS was prepared by Carl Dixon MSc. (Ecological Monitoring) and Vincent Murphy MSc. (Ecosystem Conservation and Landscape Management). Both have considerable experience in ecological assessment and the preparation of Natura Impact Statements for a range of large and small scale developments. Where relevant, specialist input was also received from Dr. Sorcha Sheehy PhD in relation to potential impacts on birds. A survey of the intertidal area in proximity to the proposed development was carried out by Dr. Stiofan Creaven. Additional information was provided by Arup and by Indaver, where required.

## 4. Stage 1 Screening

The screening report is laid out as follows: Section 4.1 - description of the project, Section 4.2 - main features of the project, 4.3 - appraisal of ecological baseline conditions, 4.4 **-** Natura 2000 sites, 4.5 Identification of potential impacts and 4.6 Screening Conclusion.

### 4.1 Description of the project (See Appendices 7 and 8).

Indaver proposes to develop a Resource Recovery Centre in Ringaskiddy in County Cork. The proposed development will include a waste-to-energy facility for the treatment of up to 240,000 tonnes per annum of residual household, commercial and industrial, non-hazardous and suitable hazardous waste. 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 line with European and national policy, this residual waste will be diverted away from landfill and exports, moving the management of waste up the hierarchy, allowing Ireland to become more self-sufficient in the treatment of waste and reducing the environmental impact of residual waste management. The proposed development will maximise the extraction and recovery of valuable material (in the form of ferrous and non ferrous metals) and energy (in the form of 21 megawatts of electricity) resources from residual waste. The location of the site is shown in **Appendix 1 Figure 1,** and an overview of the proposed development is provided in **Appendix 1, Figure 2.**

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 is located approximately 800m east of the village of Ringaskiddy.

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 site is relatively level to the immediate south of the L2545 road and rises up steeply to the south. At the top of this steep scarp the ground rises more gently to the southern site boundary along the top of the ridge.

The site encircles the Hammond Lane Metal Recycling Company's facility. Hammond Lane expanded its facilities in 2015. There is also an ESB Networks compound located adjacent to the eastern boundary of the Hammond Lane facility. The land to the immediate south of

the Indaver site is owned by IDA Ireland and is in agricultural use. The land to the west of the site is also in agricultural use.

### 4.2 Main features of the Ringaskiddy Resource Recovery Centre

The main elements of the proposed Ringaskiddy Resource Recovery Centre are a waste-to-energy facility (waste incinerator), an upgrade of a section of the L2545 road, coastal protection measures on Gobby Beach, a connection to the national electrical grid, and raising the ground levels in part of the site. The proposed Ringaskiddy Resource Recovery Centre is described below.

The waste-to-energy facility, or incinerator with energy recovery,will treat up to up to 240,000 tonnes per annum of residual household, commercial and industrial non-hazardous and hazardous waste which is currently landfilled or exported. The 240,000 tonnes per annum will include up to 24,000 tonnes per annum of suitable hazardous waste, which will be treated at the facility.

It is proposed that the waste-to-energy facility will operated 24 hours per day, seven days a week and for an average of 8,000 hours per year. There will be planned shut downs for maintenance. Waste acceptance will be limited to the hours 06.00 to 20.00 on week days and 09.00 to 14.00 on Saturdays.

#### 4.2.1 Overview of waste-to-energy facility

The waste-to-energy facility will have the following elements:

- Main process building: this building will be up to 176m x 81m in plan and up to 45.7m in height, with a stack extending to 75m above Ordnance Datum. This building will accommodate the main waste-to-energy plant and equipment including the bunker, the furnace, the boiler and the flue gas cleaning equipment and ancillary equipment. The warehouse, for spare parts storage, an administration area containing facilities and offices for the waste-to-energy operations staff and a laboratory, and a workshop will be located in this building.
- Turbine hall: this building will be located to the south of the main process building and will be circa 25m x 15m in plan and 16m in height. This building will house the steam turbine. The aero-condenser structure will be locate adjacent to the turbine hall and will support the air cooled condenser fans.
- Security building/gate house: this will be a small, single storey area which forms part of the the administration building. The site security personnel will be based in this building, from which they will control access to the site.
- Administration building; this building will be a two-storey building located to the west of the main entrance. The building will primarily contain office space and meeting rooms for staff but will also have a visitors' centre and a training centre.
- Firewater storage tank and pump house: The storage tank for the water to be used in fighting a fire and a building to house the fire water pumps will be located in the south-eastern corner of the site.
- Surface water attenuation tank and firewater retention tank: tanks for the storage of surface water and potentially contaminated water, following use in fighting a fire, will be located underneath the administration building car park in the northern part of the site.
- Weigh bridges: these will be located in the main entrance, adjacent to the gate house.

- Light fuel oil storage tank, ammonia storage tank: a tank for the storage of light fuel oil and a tank for the storage of ammonia will be located in the southern part of the site.
- Aqueous waste tank: aqueous waste will be stored in a take, which will be located adjacent to the aero-condenser structure.
- The electricity import/export substation and compound within the Indaver site will be located east of the main entrance to the waste-to-energy facility.
- Site Lighting will include a mixture of 6m high pole mounted lights to light up entrances and roads with full cut off LED light head fixtures to reduce any light pollution into the surrounding area. There will be 3 number low intensity obstacle lights at the top of the stack, Emergency access: a second site access will be provided, for use in emergencies.
- A public amenity footpath and viewing gallery, located outside the facility's security fence, will be provided along part of the southern and eastern site boundaries.

The design of the proposed facility has been optimised to include the most up to date emissions control and flue gas cleaning technology. The waste-to-energy process will consist of a number of main process elements as follows:

- waste acceptance
- waste intake and storage
- combustion process
- energy recovery process
- Emissions reduction/ flue gas cleaning.

### 4.2.2 Waste Intake

***Solid Waste***

Solid hazardous and non-hazardous waste will arrive at the site in covered trucks. All trucks carrying waste to the waste-to-energy facility will pass through a scanner to detect the presence of any radioactive elements. Radioactive waste will not be accepted in the facility.

The trucks carrying waste will be weighed when entering and leaving the facility. Drivers will present their documentation, relating to the waste load, to the staff in the security gatehouse. Some trucks, on long-term contracts and carrying non-hazardous waste, will access the facility using a swipe card, which will record their details.

Following completion of the waste acceptance procedures, the trucks carrying solid waste will proceed via the site road to the enclosed waste reception or tippinghall.

The trucks containing solid waste will enter the supervised reception hall and will be directed towards discharge chutes. The trucks will discharge the waste into the bunker through chutes in the wall of the waste reception hall.

To prevent the emission of odours, the waste reception hall will be maintained under negative pressure, i.e. air will be drawn in through any openings rather than escaping out. Air for combustion will be drawn from the reception hall through the waste bunker. As the waste reception hall will be an enclosed area, windborne litter will not be generated.

The waste bunker capacity has been chosen to allow the facility to accept waste during periods when the furnace is shut down for maintenance and also to allow the facility to continue operating over prolonged periods, such as long weekends, without deliveries.

Crane operators, positioned in the control room/crane operator room overlooking the bunker, will use travelling grab cranes to mix the waste in the bunker, so that despite the variety within the solid waste loads delivered, the feed to the furnace will be relatively uniform. The waste will be transferred by crane from the bunker via a hopper to the furnace.

*Aqueous waste*

Aqueous waste, which will be delivered by road tanker, will be sampled and analysed prior to offloading. This sampling may be done before or after arrival on site. If sampled and analysed on site, the sampling will be done in the aqueous waste unloading area adjacent to the aqueous waste storage tank. Key parameters will be analysed to ensure conformity with the specified waste acceptance criteria and with the parameters agreed with customers. In the event that the specification for the aqueous waste load is not met, the waste will not be accepted and arrangements will be made for the dispatch of the road tanker to the most suitable facility either in Ireland or abroad. If the aqueous waste load meets the acceptance criteria, the waste will be offloaded either into the aqueous waste storage tank or, directly, by injection to the furnace.

### 4.2.3 Combustion Process

A moving grate furnace is proposed for the facility. Grate furnaces are used for the destruction of a wide variety of waste streams and are a well-recognised, robust and established technology for these purposes. Waste is burned on the grate for a period of 1 hour approximately, and the resultant flue gases must maintain a temperature of 850°C for a minimum of 2 seconds after the last injection of air to ensure complete combustion of any volatiles and unburned flue gas components. In reality the flue gas temperatures range from 850°C to 1,200°C in the combustion zone above the grate. These temperatures ensure destruction of organics and other flue gas components. This means that a hazardous substance that is fed into the furnace does not come out unchanged as the same hazardous substance, either in the residues or in the exhaust gases. In the furnace the hazardous substance is oxidised which means it under goes a chemical reaction and is converted into one or more different substances with different properties. These different substances are removed in the ash or flue gas cleaning residues and a very small quantity is discharged to the air in the exhaust gases. Compounds such as dioxins which form after combustion is complete (and at lower temperature windows in the boiler of around 450°C) are removed by the injection of activated carbon/clay.

The moving grate furnace will operate in a similar fashion to an escalator, pushing waste from the top of the furnace to the bottom to ensure complete combustion. The moving grate furnace is considered to be a ‘Best Available Technique’ for the treatment of the types of waste proposed.

The moving grate mechanism will transport the waste slowly from the feed point at the top of the furnace to the ash discharge at the bottom of the furnace. The rate at which the waste will travel through the furnace will be controlled to optimise the combustion. The waste will be in the furnace for approximately one hour.

As the waste enters the hot furnace the material will be heated due to contact with the hot flue gases and radiated heat from the walls of the furnace. The initial heat will drive off the moisture from the waste. In the next stage in the combustion process, the combustible gases and vapours will be driven off.

The volatile components of the organic material contained in municipal solid waste typically are produced in the form of hydrogen, carbon monoxide, methane and ethane. The combustion of these volatiles will take place in the furnace, immediately above the surface of the waste and in the combustion chamber above the grate.

The volatile gases and vapours released will immediately ignite in the furnace due to the temperature of the furnace gas, which will be within the range 850˚C and 1,000˚C. Typical mean residence times of the gases and vapours in the combustion chamber will be 2 to 4 seconds.

The final section of the grate will be the burnout section where the ash will be held for long enough to ensure sufficient burnout.

The grate will discharge the resultant bottom ash into a water bath/ wet de-slaggers, and then via a conveyor to the ash hall.

Ash, which is finer than the bottom ash, will fall through the slits and gaps between the grate bars of the furnace into hoppers located under the grate. This finer ash, known as 'grate siftings', will be transferred by conveyor belt from the hoppers to the water bath/wet de-slaggers.

### 4.2.4 Energy Recovery

The hot flue gases from the moving grate furnace will be directed through a steam boiler. In the boiler heat will be transferred from the hot flue gases to water to generate steam. The steam from the boiler will drive a turbine, which will drive an electricity generator. Approximately 21MW of electricity will be generated, of which approximately 18.5MW will be exported to the national electrical grid.

### 4.2.5 Emission Reduction

*Dioxins and Furans*

Dioxins and furans are complex chlorinated hydrocarbon molecules, which are formed as a consequence of any combustion process. The facility will be designed to minimise the formation of dioxins and furans (the term 'dioxin' is taken to include dioxins and furans) in the furnace by maintaining the flue gases at a high temperature of over 850˚C for over 2 seconds. However, there is the potential that formation of dioxins would occur over the temperature range 450˚C to 250˚C during cooling of the flue gases in the latter stages of the boiler. In order to minimise the formation of dioxins in the boiler the following design measures will be implemented:

- Automatic controlled cleaning, by mean of fixed installed cleaning devices, of the heat transfer surfaces in the boiler to reduce the amount of metals, particularly copper, present which can act as a catalyst in the formation of dioxins.
- Rapid cooling over the range 450˚C to 250˚C by increasing the velocity of the flue gases through the section of the boiler where cooling over this temperature range will occur. This increase in velocity will accelerate heat transfer and cool the gases more rapidly.

These measures will reduce the dioxin concentration in the flue gases to a low level. The flue gas cleaning equipment, described below, will further reduce dioxin concentrations in the flue gas to well below the EU emission limits.

*Oxides of Nitrogen*

All combustion processes lead to the formation of oxides of nitrogen. These will be controlled in two ways. The combustion process in the furnace will be optimised to minimise the oxidation of nitrogen in the combustion air and the furnace materials will be selected to ensure optimal flue gas temperature. Ammonia solution or urea will be injected into the flue gases into the first section of each boiler. This process uses the chemical reaction of ammonia and nitrogen oxides at high temperature to convert nitrogen oxides to nitrogen and water vapour.

### 4.2.6 Flue Gas Cleaning

The flue gas cleaning equipment will reduce dioxin concentrations in the flue gas to levels well below the limit set in the EU Industrial Emissions Directive 2010/75/EC. Typical dioxin emissions from a facility with this equipment are one tenth of the concentration limit in the EU Industrial Emissions Directive.

The flue gas leaving the boiler will still be relatively hot at approximately 180˚C and will be further cooled in the cooling section to a temperature of about 145˚C. The lower temperature is required for the optimal operation of the lime and activated carbon or clay injection downstream.

A fixed amount of activated carbon or a carbon/clay mixture will be injected into the flue gases in the cooling stage and also into the flue gas either in the dry reactor or just after it. Activated carbon consists of small, porous carbon particles, which due to their porosity have a very large surface area. Dioxins, furans, other trace organic compounds and heavy metals in the flue gases will be adsorbed onto the activated carbon particles. The flue gases will then pass through a baghouse filter which will remove the dust, salts and the carbon particles from the gases. The dust cake forming in the baghouse filter will be removed and collected in hoppers located below.

The flue gases will then be discharged through the stack, the top of which will be at a level of 75mOD.

The stack emissions will be monitored as required by the EU Industrial Emissions Directive and in compliance with industrial emission licence.

### 4.2.7 Ash and Solid Residues

Three types of ash and residues will be produced in the waste-to-energy plant. The average annual ash tonnages, assuming the plant is operating for 8000 hours, are given below:

- Bottom ash, 52,664 tonnes (15% moist)
- Boiler ash, 2,000 tonnes
- Flue gas cleaning residues, 9,104 tonnes

The bottom ash will be a non-hazardous material and may be suitable for use in road construction. It is expected that the flue gas cleaning residues will be classified as requiring disposal in a hazardous waste landfill. It will be exported abroad for recovery in a salt mine or for disposal to a hazardous waste landfill, until a suitable landfill for hazardous waste is developed in Ireland. The boiler ash will be treated the same way as the flue gas cleaning residues. An annual average of 2,400 tonnes of ferrous metals, such as steel and 240 tonnes non-ferrous metals will be recovered from the bottom ash for recycling.

### 4.2.8 Process Inputs

The average conusmption of water in the proposed faclity will be 6.08 cubic metres per hour. Circa 400 tonnes of light fuel oil will be used per annum to raise the temperature of the furnace at start up and to maintain the temperature as required. Other materials which will be consumed will included lime, sodium hydroxide, hydrochoric acid, ammonia or urea, activated carbon and activate carbon/clay mix.

### 4.2.9 L2545 Road Upgrade

Upgrade works are proposed to a section of the L2545 local road, which is the road that adjoins the northern boundary of the site. The proposed works will consist of raising the level of a section of the road and improving the surface water drainage to alleviate local flooding issues along the road.

*Background to flooding of the L2545 road*

Part of the L2545 road close to Gobby Beach is below the calculated 1 in 200 year high tide level. The L2545 road, which adjoins the northern boundary of the site, is prone to flooding during periods of heavy rainfall combined with high tide. The existing storm water drainage system along the road is collected in a 450mm diameter pipe. This drainage pipe discharges into the sea at Gobby Beach. Once the level of the tide rises above the level of the outfall from the pipe, the surface water is unable to discharge and collects in the pipe. Rain water falling on the road subsequently cannot discharge and collects on the road. In addition, there are a minimal number of gullies along the road to collect the rain water and transfer it to the 450mm diameter pipe.

Part of the western field area of the Indaver site is at a lower level than the adjacent road. A number of channels have been cut in the mound which forms the road boundary of the western field. These channels allow surface water to drain from the road into the western field.

*Description of L2545 Upgrade*

The L2545 upgrade has been designed to address the above issues.

The proposed L2545 upgrade works will include raising a 185m length of the road to a maximum height of 3.45m above ordnance datum between the car park and the eastern end of the Hammond Lane Metal Company premises. This level is approximately 0.9m above the existing road level. This will elevate the road to above the 200 year design tidal high water level, which has been estimated as 2.73m OD, plus an allowance for climate change. This will offer a high level of protection to the road from tidal flooding. There will be a smooth transition from the new level down to existing road levels, in accordance with road design standards. The recently constructed footpath on the northern side of the road will also be raised to the new road level.

The proposed road drainage upgrade will extend along the entire northern boundary of the Indaver site. Oversized drainage pipes will be placed underneath the road to provide storage for rainwater. The storage has been designed to cater for the 6.5 hours, when the tide level is above the level of the end of the outfall pipe, and a 1 in 30 year rainfall event plus an allowance for climate change. New drainage channels and gullies will be provided in the road and a new Class 1 bypass hydrocarbon interceptor will be installed on the outfall pipe. All of the above works will be within Indaver ownership, apart from a small area in Hammond Lane ownership. Consent has been given by Hammond Lane to undertake these works. Further details on flood risk are provided in **Flood Risk Assessment, Appendix 16**

### 4.2.10 Increase in levels of the Indaver site

The ground levels of the Indaver site vary considerably in both the north-south direction and the east-west direction. Along the southern boundary of the site the levels vary from circa 10m OD to circa 41m OD. Along the northern boundary of the site the ground levels vary from circa 2.4m OD to circa 4.0m OD. The levels of the low-lying parts of the site will be raised to 4.55m OD. This level will offer a very high standard of flood protection to the site.

### 4.2.11 Coastal Protection Measures

Coastal protection measures are proposed along the eastern boundary of the Indaver site. It is proposed that approximately 1,100m$^3$ of sacrificial material, comprising shingle of appropriate size and rounded shape, are deposited on the beach in the area extending from the car park at the north-eastern corner to the southern boundary of the Indaver site.

The sacrificial material has been designed to remain on site and help lower the natural erosion rate over a number of years. The length of time that the material remains in place

will depend on the occurrence of extreme wave events. The sacrificial material and the glacial till face will be monitored and the sacrificial material will be replenished as required

The proposed protection measures are a soft solution and will not have significant affect the adjoining areas of coastline in the vicinity of the site. The net coastal sediment transport will go from south to north according to wind conditions and swell. Therefore the material is likely to move towards the north in the medium and long term. The Cork Harbour Special Protection Area (SPA) is located to the south west of the site. The sacrificial material will not impact on the SPA.

### 4.2.12 Grid Connection

The waste-to-energy facility will be connected to the national electrical grid via the ESB Lough Beg 38kV electrical substation adjacent to the eastern boundary of the Hammond Lane facility. ESB Networks has confirmed that the extension of the 38kV line into the Indaver site could be over ground or underground. Indaver has selected the underground option and the proposed routing for the underground lines has been identified on the drawings. The routing has been designed in line with ESB guidelines and standards. The electricity import/export substation and compound will be located east of the main entrance to the waste-to-energy facility. The compound will be divided into two adjacent parts. One part will be dedicated to the infrastructure required by ESB Networks and will also contain a substation building for the ESB metering and associated equipment. The other part will accommodate Indaver's equipment and will contain a transformer and other associated equipment. Within the ESB Lough Beg 38kV substation, the connection will be via a cable connection within the ESB substation building or a cable connection directly to a cable on the existing end mast.

### 4.2.13 Implementation of Best Available Techniques in the Waste-To-Energy Facility

Best Available Techniques are techniques recommended by the EU for use in designing industrial facilities to minimise pollution.

Best Available Techniques have been included in the design of the proposed Ringaskiddy Resource Recovery Centre and will be applied in its ongoing operation, management and control. These include:

- plant management systems,
- plant safety systems,
- waste inspection, checking, testing and acceptance,
- waste handling and storage,
- choice of furnaces and flue gas cleaning systems,
- design, operation and control of the furnaces and flue gas cleaning systems,
- energy recovery and energy efficiency,
- optimisation of resource use, and
- handling of residues

### 4.3 Appraisal of ecological baseline conditions

**Appendix 10** of this NIS details the ecological baseline of the proposed development site based on direct surveys of the entire Indaver site and surrounding area and a review of desktop data. A flora and fauna report was prepared previously by the Aquatic Services Unit, University College Cork in 2001 for an EIS for the Indaver Ireland planning application for a Waste Management Facility at this location. Dixon Brosnan previously prepared the Flora and Fauna chapters for similar EISs submitted in 2008 and an addendum to the EIS prepared in 2010. These reports were consulted during the preparation of the EIS.

In addition to the baseline surveys carried out for previous applications, the following surveys were carried out in 2014/2015:

- Habitat mapping
- Surveys of wintering birds
- Breeding birds surveys
- Common tern breeding survey
- Intertidal survey

### 4.3.1 Habitat Mapping

Terrestrial habitat mapping was carried out in line with the methodology outlined in the Heritage Council publication *Best Practice Guidance for Habitat Survey and Mapping* (Heritage Council, 2011) in 2014 and 2015. All habitats within the study area were classified to level 3 of the classification scheme outlined in *A Guide to Habitats in Ireland* (Fossit, 2000) and cross-referenced with habitats listed under Annex I of the Habitats Directive.

Due to an absence of high agricultural management, a high proportion of the study area, including the proposed development site, is covered in scrub which has become more dominant over time. The remainder of the site consists of pasture and tillage fields that remain under conventional agricultural management. Some areas of Japanese Knotweed were recorded outside the proposed development footprint; this will be eradicated from the site.

The following habitats were recorded within the entire Indaver landholding: Hedgerow WL1/Treelines WL2, Dry meadow and grassy verge GS2/Wet grassland GS4, Scrub WS1, Immature woodland WS2, Broadleaved woodland WD1, Improved agricultural grassland GA1, Conifer woodland WD3, Dense bracken HD1 and Arable crops BC1. Habitat value ranged from Low value (Local Importance) to Negligible. The impact on these habitats ranged from Minor to Negligible.

### 4.3.2 Marine Habitats

A survey of the intertidal area in proximity to the proposed development was carried out by Dr. Stiofan Creaven in June, 2015. The survey report is included in **Appendix 17** to the NIS. The marine flora and fauna was examined with survey effort timed to correspond with low water on a Spring tide when as much of the shore as possible is exposed. The survey classified the habitats encountered during the survey as follows:

- The upper shore here can be classed as Barren Littoral Shingle (EUNIS habitat code A2.111).
- Bedrock and boulders were found scattered throughout the mid and lower shore. Vertical surfaces on these were characterised by a barnacle-limpet community (EUNIS habitat code A1.1131).
- Boulder tops, dominated by *Fucus spiralis*, can be classified as *Fucus spiralis* on sheltered upper eulittoral rock (EUNIS habitat code A1.312). In summer, the green alga *Ulva intestinalis* can become very common – as seen on the shore at Ringaskiddy. Vertical surfaces often lack the fucoid cover and are characterised by the barnacle-limpet community (EUNIS habitat code A1.1131) also seen on this beach.
- The presence of a substantial deposit of decaying algal matter in the mid shore complicates the allocation of a habitat type to this zone though the floral and faunal community encountered closely resembles *Fucus vesiculosus* on variable salinity mid eulittoral boulders and stable mixed substrata (EUNIS habitat code A1.323). The presence of ephemeral seaweeds (green algae here) occupying available space and

patches of sediment found between the hard substrata containing the lugworm *Arenicola marina* and the sand mason *Lanice conchilega*, support this classification. The exposure level of this shore probably changes seasonally from sheltered to moderately exposed/exposed during storm events.

- The lower shore is characterised by littoral muddy sands with the habitat falling into a Polychaete/Bivalve-dominated muddy sand shore (EUNIS habitat code A2.24). Based on analysis of infaunal samples taken during the transects, this most closely resembles a *Macoma balthica* and *Arenicola marina* in muddy sand shores biotope (EUNIS habitat code A2.241) though with *Abra* present instead of *Macoma*. It also has elements of *Lanice conchilega* in littoral sand (EUNIS habitat code A2.245).

An attempt was made to obtain faunal samples at all stations visited. This effort was successful at two stations. The assemblage recorded is close to the EUNIS LS.LSa.MuSa.Lan Lanice conchilega in littoral sand grouping but instead of *Macoma balthica*, *Abra* is present. (EUNIS code A2.24 – Polychaete/bivalve dominated muddy sand shores). The common cockle (*Cerastoderma edule*) was also present here.

The report concluded that these habitats are all commonly encountered in an Irish context. Samples were faunally poor with only ten taxa present. All species found are typical of fine grained sediments of the North East Atlantic. No rare or uncommon species were recorded.

### 4.3.3 Birds

A detailed bird survey report is included as **Appendix 18**. Information on birds is summarised below.

***Breeding Bird and site usage***

Breeding bird surveys were carried out by DixonBrosnan during May 2008 using transect and point count methods. A total of 35 bird species were recorded during site visits. These results were largely comparable with those from surveys carried out at the same site in 2001. A breeding bird survey was carried also carried out by DixonBrosnan in May and June 2010 covering the area of shoreline potentially affected by coastal works and adjoining areas of habitat. Areas of scrub and grassland was found to support a mixture of typical countryside birds including Chaffinch, Willow Warbler, Wood Pigeon, Blackbird and corvid species.

As the coastal area in proximity to the site does not have extensive mudflats, there was a preponderance of species associated with rocky/shingle shore habitats. Such species include Rock Pipit, Ringed Plover and Oystercatcher. Other species noted include piscivorous species such as Common Tern, Cormorant, Grey Heron and Little Egret. Four gull species namely Herring Gull, Greater Blackbacked Gull, Common Gull and Blackheaded Gull were also recorded.

Of the species recorded during the survey, six species (Oystercatcher, Cormorant Common Tern, Grey Heron, Blackheaded Gull and Common Gull) are listed as birds of special conservation interest for the Cork Harbour SPA.

Certain bird species are listed by BirdWatch Ireland as Birds of Conservation Concern in Ireland (Lynas et al., 2007). Red List bird species are of high conservation concern, and Amber List species are of medium conservation concern. Two Red Listed species were recorded (Herring Gull and Black Headed Gull) and five amber listed species were recorded. (Swallow, Starling, Greater Black-Backed Gull, Cormorant and Common Gull).

In 2015, further breeding bird surveys were undertaken over three visits in May and June using a adapted version of the British Trust for Ornithology's (BTO) Common Bird Census Technique (Bibby *et al*., 2000 & Gilbert *et al*., 1998), with aspects of species specific survey

methodologies employed where required (Gilbert *et al*., 1998). More detail on the methodology and the results are provided in **Appendix 18.**

A total of 28 species were recorded in the breeding bird survey. However it is noted that not all of these species were breeding within the site. The results indicate that the bird community currently using the site is similar to that recorded previously. The reduction in bird species diversity (35 species in 2008 in comparison to 28 species in 2015) may be due to increased dominance of scrub and a reduction in areas of semi-natural grassland.

### *Survey of Common tern-breeding*

A breeding population of Common Tern is known to occur near the entrance to the Port of Cork approximately 750km from the proposed development area. A previous survey for the Ringaskiddy Port Redevelopment EIS (Port of Cork/RPS, 2014) recorded 45-50 breeding pairs on concrete structures (dolphins) adjacent to the entrance of the Port of Cork. Dixon Brosnan resurveyed this Common Tern breeding colony over three days in May and June 2015, as this is the most significant breeding bird colony in the surrounding landscape. Approximately 50-55 breeding pairs were recorded (mean 53 breeding pairs).

### *Winter bird surveys*

The winter bird surveys were undertaken on six dates between October 2014 and March 2015 (refer to **Appendix 18**). The survey methodology was based on that used by the British Trust for Ornithology's (BTO) Wetland Bird Survey (WeBS) and also that for the Irish Wetland Bird Survey (I-WeBS). Ninety minute counts were undertaken monthly at either high tide, mid tide and low tide. Survey vantage point locations for the winter bird counts are shown in **Appendix 18.**

A total of 38 bird species were recorded during the 2014/2015 winter bird surveys as detailed below in **Table 1**. It is noted that many of these birds were recorded overflying the channel, and that the survey covered a radius of approximately 300m from each vantage point. Five species (Mediterranean Gull, Dunlin, Little Egret, Great Northern Diver and Common Tern) are listed on Annex I of the Birds Directive. Certain bird species are listed by BirdWatch Ireland as Birds of Conservation Concern in Ireland. Red List bird species are of high conservation concern and the Amber List species are of medium conservation. Six red listed species were recorded namely Herring Gull, Curlew, Redshank, Black-Headed Gull, Dunlin and Knot.

The closest Special Protection Area (SPA) is the Cork Harbour SPA (Site Code 004030). A total of thirteen species listed as qualifying interests for the Cork Harbour SPA were recorded, namely, Cormorant, Oystercatcher, Dunlin, Curlew, Redshank, Greenshank, Great Crested Grebe, Grey Heron, Teal, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern.

**Table 1. Winter bird counts results**

| Species | High tide count total | Mid tide count (total) | Low tide count (total) |
|---|---|---|---|
| Oystercatcher | 20 | 52 | 109 |
| Blackheaded Gull | | 3 | 53 |
| Herring Gull | | 4 | 17 |
| Black Guillemot | | | 3 |
| Lesser Blackbacked gull | 3 | 1 | 6 |
| Cormorant | 9 | 9 | 14 |
| Common Gull | 10 | 27 | 64 |
| Redshank | 2 | 4 | 11 |
| Curlew | | 4 | 7 |
| Mallard | 3 | | |
| Glaucous Gull | 1 | 1 | 5 |
| Grey Heron | 1 | 3 | 10 |
| Hooded Crow | 9 | 9 | 28 |
| Wood Pigeon | 23 | 3 | 12 |
| Rook | 234 | 31 | 10 |
| Blackbird | 2 | | 8 |
| Robin | | | 2 |
| Tree Sparrow | 6 | | |
| Thrush | | 1 | |
| Little Egret | | 4 | 7 |
| Greater Blackbacked Gull | 3 | 6 | 2 |
| Greenshank | | 3 | 14 |
| Mediterranean Gull | | | 1 |
| Teal | | | 4 |
| Great Crested Grebe | | 1 | 2 |
| Brent Goose | | 69 | 107 |
| Sanderling | | 2 | |
| Goldfinch | 1 | | 2 |
| Grey Wagtail | 1 | 2 | 7 |
| Meadow Pipit | | 1 | 2 |
| Wren | | | 1 |
| Blue Tit | | 1 | 3 |
| Turnstone | | | 4 |
| Knot | | | 4 |
| Great Northern Diver | 2 | 1 | 1 |
| Dunlin | | 225 | |
| Jackdaw | 7 | | |
| Starling | | 30 | |

### *Winter roost cormorant*

A night-time tree-roosting Cormorant survey was undertaken within Monkstown Creek during the 2011/12 and 2013/14 wintering seasons as part of the Ringaskiddy Port Redevelopment, Environmental Impact Statement (Port of Cork, 2014). The surveys recorded that during both wintering periods the Monkstown Creek tree-roost regularly supported nationally important numbers of roosting Cormorants. The number of cormorants using the Monkstown Creek tree-roost rose through late summer and autumn, peaking in October/November. The total peak number of birds recorded using the tree-roost was 334 birds, representing 2.45% of the most recently published Irish wintering population of 13,710 and 54.19% of the Cork Harbour SPA qualifying population at the time of designation (620 wintering individuals). The peak count also represents 133% of the most recently 5-year mean for Cork Harbour (252 individuals). The closest site, included within this night-time tree-roosting Cormorant survey, is located 1km from the proposed development area within the Indaver site.

### *Birds summary*

Overall, the study area is of local value for a range of terrestrial bird species that are relatively common in the Irish countryside. The study area is of more value than the intensively agriculturally managed land in this area due to the presence of a greater diversity of habitats and semi-natural habitat. These have arisen due to an absence of active management of parts of the site. However, the study area does not support a community of birds or individual species that would be considered significant conservation value, and the study area, which is small, does not provide critical resources for such communities and/or species.

The coastal area adjoining the site consists primarily of rock and shingle, and therefore does not support the high numbers of wintering waders that are characteristic of high value mudflats with high densities of macro-invertebrates. Some species that are considered of high conservation value (Annex I of the Birds Directive, qualifying species for the Cork Harbour SPA and Red List) were noted in this general area. Many of these birds were recorded overflying the channel, and the site itself and the shoreline adjoining the site, did not support high numbers of these species.

## 4.4 Natura 2000 sites

### 4.4.1 Designated sites within a 20km radius

Natura 2000 sites within a 20km radius of the proposed development site are listed below in Table 2. These Natura 2000 sites are shown in Figure 3. It is noted that use of a 20km radius is a precautionary measure, as impacts at this distance from the proposed development are highly unlikely in the absence of significant aqueous emissions to the marine environment. Air emissions will not be significant at 20km from the site.

**Table 2. Designated sites within 20km**

| Designated site | Distance from site of proposed development |
|---|---|
| **Candidate SAC sites** | |
| Great Island Channel candidate Special Area of Conservation (Site code 001058) | Approximately 5 km north |
| **SPA sites** | |
| Cork Harbour Special Protection Area (Site code 004030)* | Approximately 0.5 km south |
| Ballycotton Bay Special Protection Area (Site code 004022) | Approximately 18.4km east |
| Sovereign Islands SPA (Site code 004124) | Approximately 19.7km southwest |

*The SPA has been extended to include the estuary at Ringabella.

### 4.4.2 Qualifying interests

The qualifying interests for the Great Island Channel cSAC, Cork Harbour SPA and Ballycotton Bay SPA and Sovereign Islands SPA and the relevant conservation objectives are listed in **Tables 3, 4, 5 and 6** respectively.

**Table 3. Qualifying interests for the Great Island Channel SAC (001058)**

| Habitat Code | Habitat | Conservation objectives |
|---|---|---|
| 1140 | Mudflats and sandflats not covered by seawater at low tide | Maintain |
| 1330 | Atlantic salt meadows (Glauco-Puccinellietalia maritimae) | Restore |

**Table 4. List of qualifying interests under the EU Birds Directive for Cork Harbour SPA 004030**

| Annex of EU Birds Directive | Common Name | Scientific name | Conservation objectives |
|---|---|---|---|
| N/A | Cormorant | *Phalacrocorax carbo* | Maintain |
| N/A | Shelduck | *Tadorna tadorna* | Maintain |
| N/A | Oystercatcher | *Haematopus ostralegus* | Maintain |
| Annex 1 | Golden Plover | *Pliuvialis apricaria* | Maintain |
| N/A | Lapwing | *Vanellus vanellus* | Maintain |
| N/A | Dunlin | *Calidris alpine* | Maintain |
| N/A | Black-tailed godwit | *Limosa limosa* | Maintain |
| N/A | Bar-tailed godwit | *Limosa lapponica* | Maintain |
| N/A | Curlew | *Numenius arquata* | Maintain |
| N/A | Redshank | *Tringa tetanus* | Maintain |
| N/A | Greenshank | *Tringa nebularia* | Maintain |
| Annex 1 | Common tern | *Sterna hirundo* | Maintain |
| N/A | Little grebe | *Tachybaptus ruficollis* | Maintain |
| N/A | Great crested grebe | *Podiceps cirstatus* | Maintain |
| N/A | Grey heron | *Ardea cinerea* | Maintain |
| N/A | Wigeon | *Anas Penelope* | Maintain |
| N/A | Teal | *Anas crecca* | Maintain |
| N/A | Pintail | *Anas acuta* | Maintain |
| N/A | Shoveler | *Anas clypeata* | Maintain |
| N/A | Red-breasted merganser | *Mergus serrator* | Maintain |
| N/A | Grey plover | *Pliuvialis sqyuatarola* | Maintain |
| N/A | Black-headed gull | *Larus ribundus* | Maintain |
| N/A | Common gull | *Larus canus* | Maintain |
| N/A | Lesser black-backed gull | *Larus fuscus* | Maintain |
| | Wetlands | | |

**Table 5. List of qualifying interests under the EU Birds Directive for Ballycotton Bay SPA (Site Code 004022)**

| Annex of EU Birds Directive | Common Name | Scientific name | Conservation Objectives |
|---|---|---|---|
| N/A | Teal | *Anas crecca* | **Objective 1:** To maintain the favourable conservation condition of the non-breeding waterbird Special Conservation Interest species listed for Ballycotton Bay SPA.<br><br>**Objective 2:** To maintain the favourable conservation condition of the wetland habitat at Ballycotton Bay SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. |
| N/A | Ringed Plover | *Charadrius hiaticula* | |
| Annex 1 | Golden Plover | *Pliuvialis apricaria* | |
| N/A | Grey plover | *Pliuvialis sqyuatarola* | |
| N/A | Lapwing | *Vanellus vanellus* | |
| N/A | Black-tailed Godwit | *Limosa limosa* | |
| N/A | Bar-tailed Godwit | *Limosa lapponica* | |
| N/A | Curlew | *Numenius arquata* | |
| N/A | Turnstone | *Arenaria interpres* | |
| N/A | Common gull | *Larus canus* | |
| N/A | Lesser Black-backed gull | *Larus fuscus* | |
| | Wetlands | | |

**Table 6 List of qualifying interests under the EU Birds Directive for Sovereign Islands SPA(Site code 004124)**

| Annex of EU Birds Directive | Common Name | Scientific name | Conservation Objecitve |
|---|---|---|---|
| N/A | Cormorant | *Phalacrocorax carbo* | To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA |

### 4.4.3 Site synopses

***Cork Harbour Special Protection Area (Site Code 004030)***

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra. The SPA site comprises most of the main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas River Estuary, inner Lough Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay and the Rostellan and Poulnabibe inlets.

Owing to the sheltered conditions, the intertidal flats are often muddy in character. These muds support a range of macro-invertebrates, notably *Macoma balthica*, *Scrobicularia plana*, *Hydrobia ulvae*, *Nepthys hombergi, Nereis diversicolor* and *Corophium volutator*. Green algae species occur on the flats, especially *Ulva lactua* and *Enteromorpha* spp. Cordgrass (*Spartina* spp.) has colonised the intertidal flats in places, especially where good shelter exists, such as at Rossleague and Belvelly in the North Channel. Salt marshes are scattered through the site and these provide high tide roosts for the birds. Salt marsh species present include Sea Purslane (*Halimione portulacoides*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Common Saltmarsh-grass (*Puccinellia maritima*), Sea Plantain (*Plantago maritima*), Laxflowered Sea-lavender (*Limonium humile*) and Sea Arrowgrass (*Triglochin*

*maritima*). Some shallow bay water is included in the site. Cork Harbour is adjacent to a major urban centre and a major industrial centre. Rostellan Lake is a small brackish lake that is used by swans throughout the winter. The site also includes some marginal wet grassland areas used by feeding and roosting birds.

The site is designated as a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Blacktailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Cork Harbour is an internationally important wetland site, regularly supporting in excess of 20,000 wintering waterfowl, for which it is amongst the top five sites in the country. The two-year mean of summed annual peaks for the entire harbour complex was 55,401 for the period 1995/96 and 1996/97. Of particular note is that the site supports internationally important populations of Black-tailed Godwit (905) and Redshank (1,782) - all figures given are average winter means for the two winters 1995/96 and 1996/97. At least 18 other species have populations of national importance, as follows: Little Grebe (51), Great Crested Grebe (204), Cormorant (705), Grey Heron (63), Shelduck (2,093), Wigeon (1,852), Teal (922), Pintail (66), Shoveler (57), Red-breasted Merganser (88), Oystercatcher (1,404), Golden Plover (3,653), Grey Plover (84), Lapwing (7,688), Dunlin (10,373), Bartailed Godwit (417), Curlew (1,325) and Greenshank (26). The Shelduck population is the largest in the country (over 10% of national total). The site has regionally or locally important populations of a range of other species, including Whooper Swan (10), Pochard (145) and Turnstone (79). Other species using the site include Gadwall (13), Mallard (456), Tufted Duck (113), Goldeneye (31), Coot (53), Mute Swan (38), Ringed Plover (34) and Knot (38). Cork Harbour is a nationally important site for gulls in winter and autumn, especially Black-headed Gull (4,704), Common Gull (3,180) and Lesser Black-backed Gull (1,440).

A range of passage waders occurs regularly in autumn, including such species as Ruff (5-10), Spotted Redshank (1-5) and Green Sandpiper (1-5). Numbers vary between years and usually a few of each of these species over-winter.

The wintering birds in Cork Harbour have been monitored since the 1970s and are counted annually as part of the I-WeBS scheme.

Cork Harbour has a nationally important breeding colony of Common Tern (3-year mean of 69 pairs for the period 1998-2000, with a maximum of 102 pairs in 1995). The birds have nested in Cork Harbour since about 1970, and since 1983 on various artificial structures, notably derelict steel barges and the roof of a Martello Tower. The birds are monitored annually and the chicks are ringed.

Extensive areas of estuarine habitat have been reclaimed since about the 1950s for industrial, port-related and road projects, and further reclamation remains a threat. As Cork Harbour is adjacent to a major urban centre and a major industrial centre, water quality is variable, with the estuary of the River Lee and parts of the Inner Harbour being somewhat eutrophic. However, the polluted conditions may not be having significant impacts on the bird populations. Oil pollution from shipping in Cork Harbour is a general threat. Recreational activities are high in some areas of the harbour, including jet skiing which causes disturbance to roosting birds.

Cork Harbour is of major ornithological significance, being of international importance both for the total numbers of wintering birds (i.e. > 20,000) and also for its populations of Black-tailed Godwit and Redshank. In addition, there are at least 18 wintering species that have populations of national importance, as well as a nationally important breeding colony of Common Tern. Several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Golden Plover, Bar-tailed Godwit, Ruff and Common Tern. The site provides both feeding and roosting sites for the various bird species that use it. (NPWS, 2008).

***Site synopsis Great Island Channel SAC (Site Code: 001058)***

The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest. Geologically, Cork Harbour consists of two large areas of open water in a limestone basin, separated from each other and the open sea by ridges of Old Red Sandstone. Within this system, Great Island Channel forms the eastern stretch of the river basin and, compared to the rest of Cork Harbour, is relatively undisturbed. Within the site is the estuary of the Owennacurra and Dungourney Rivers. These rivers, which flow through Midleton, provide the main source of freshwater to the North Channel.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1140] Tidal Mudflats and Sandflats

[1330] Atlantic Salt Meadows

The main habitats of conservation interest in Great Island Channel SAC are the sheltered tidal sand and mudflats and the Atlantic salt meadows. Owing to the sheltered conditions, the intertidal flats are composed mainly of soft muds. These muds support a range of macro-invertebrates, notably Macoma balthica, Scrobicularia plana, Hydrobia ulvae, Nepthys hombergi, Nereis diversicolor and Corophium volutator. Green algal species occur on the flats, especially Ulva lactua and Enteromorpha spp. Cordgrass (Spartina spp.) has colonised the intertidal flats in places, especially at Rossleague and Belvelly.

The saltmarshes are scattered through the site and are all of the estuarine type on mud substrate. Species present include Sea Purslane (Halimione portulacoides), Sea Aster (Aster tripolium), Thrift (Armeria maritima), Common Saltmarsh-grass (Puccinellia maritima), Sea Plantain (Plantago maritima), Greater Sea-spurrey (Spergularia media), Lax-flowered Sea-lavender (Limonium humile), Sea Arrowgrass (Triglochin maritimum), Sea Mayweed (Matricaria maritima) and Red Fescue (Festuca rubra).

The site is extremely important for wintering waterfowl and is considered to contain three of the top five areas within Cork Harbour, namely North Channel, Harper's Island and Belvelly-Marino Point. Shelduck is the most frequent duck species with 800-1,000 birds centred on the Fota/Marino Point area. There are also large flocks of Teal and Wigeon, especially at the eastern end. Waders occur in the greatest density north of Rosslare, with Dunlin, Godwit, Curlew and Golden Plover the commonest species. A population of about 80 Grey Plover is a notable feature of the area. All the mudflats support feeding birds; the main roost sites are at Weir Island and Brown Island, and to the north of Fota at Killacloyne and Harper’s Island. Ahanesk supports a roost also but is subject to disturbance. The numbers of Grey Plover and Shelduck, as given above, are of national importance.

The site is an integral part of Cork Harbour which is a wetland of international importance for the birds it supports. Overall, Cork Harbour regularly holds over 20,000 waterfowl and contains internationally important numbers of Black-tailed Godwit (1,181) and Redshank

(1,896), along with nationally important numbers of nineteen other species. Furthermore, it contains large Dunlin (12,019) and Lapwing (12,528) flocks. All counts are average peaks, 1994/95 – 1996/97. Much of the site falls within Cork Harbour Special Protection Area, an important bird area designated under the E.U. Birds Directive.

While the main land use within the site is aquaculture (oyster farming), the greatest threats to its conservation significance come from road works, infilling, sewage outflows and possible marina developments.

The site is of major importance for the two habitats listed on Annex I of the E.U. Habitats Directive, as well as for its important numbers of wintering waders and wildfowl. It also supports a good invertebrate fauna. (NPWS, 2013).

***Site synopsis Soverign Islands SPA (Site Code: 004124)***

The Sovereign Islands are two very small islands located approximately 1 km off the Cork coastline at the entrance to Oysterhaven Bay. The islands are rocky stacks separated by a narrow sound of about 20 m width. The eastern island is flat-topped and rises to 24 m above sea level, the western one is more peaked and rises to 30 m. The geology is Lower Carboniferous limestones and shales. Both islands are largely devoid of soil apart from small amounts of organic matter trapped in cracks. Vegetation is sparse, with species such as Sea Beet (Beta vulgaris), Spurrey (Spergularia spp.) and Orache (Atriplex spp.) recorded. The surrounding seasto a distance of 200m, where seabirds forage, bathe and socialise, are included in the site.

The islands are important for breeding seabirds, with most on the eastern stack. A Cormorant colony has been known since the late 1960s and in 1999 156 nests were counted. Herring Gulls and Great Black-backed Gulls also breed, with 10 and 75 pairs respectively in 1999. The only other seabird which has been recorded breeding in recent years is Black Guillemot, with 10 individuals in April 1999.

This site is of ornithological importance mainly for the breeding colony of Cormorant, which is the largest in County Cork and is of National Importance. The population of Great Black-backed Gulls is also of National Importance. The site provides a very safe refuge for the nesting birds. Regular monitoring of the seabird populations has been carried out since the 1980s. (NPWS, 2003).

***Site synopsis Ballycotton Bay SPA (Site Code: 004022)***

Situated on the south coast of Co. Cork, Ballycotton Bay is an east-facing coastal complex, which stretches northwards from Ballycotton to Ballynamona, a distance of c. 2 km. The site comprises two sheltered inlets which receive the flows of several small rivers. The southern inlet had formerly been lagoonal (Ballycotton Lake) but breaching of the shingle barrier in recent times has resulted in the area reverting to an estuarine system.

The principal habitat within the site is inter-tidal sand and mudflats. These are mostly well-exposed and the sediments are predominantly firm sands. In the more sheltered conditions of the inlets, sediments contain a higher silt fraction. The inter-tidal flats provide the main feeding habitat for the wintering birds. Sandy beaches are well represented. The shingle beach is mobile and is influenced by storms, which create open conditions that favour a particular suite of species. Species found here include Grass-leaved Orache (Atriplex littoralis), Black Mustard (Brassica nigra), Sand Couch (Elymus farctus) and Lyme-grass (Leymus arenarius). Also growing on the shingle beach is Sea-kale (Crambe maritima), a rare species that is listed in the Red Data Book. Salt marshes fringe the flats in the sheltered inlets and these provide high tides roosts. A small area of shallow marine water is also included.

Ballycotton Bay supports an excellent diversity of wintering waterfowl species, and has nationally important populations of nine species as follows (all figures are average peaks for the 5 winters 1995/96-1999/00): Teal (1,296), Ringed Plover (248), Golden Plover (4,284), Grey Plover (187), Lapwing (4,371), Sanderling (79), Bar-tailed Godwit (261), Curlew (1,254) and Turnstone (288). Other species which occur in important numbers, and at times exceed the threshold for national importance, include Shelduck (137), Wigeon (757), Mallard (366), Oystercatcher (362), Dunlin (812), Black-tailed Godwit (168), Redshank (149) and Greenshank (17). The population of Golden Plover is of particular note as it represents 2.8% of the national total, while the Grey Plover and Lapwing populations each represent 2.5% of their respective national totals. Ballycotton Bay was formerly of importance for Bewick's Swan but the birds have abandoned the site since the reversion of the lagoonal habitat to estuarine conditions. The site is also important for wintering gulls, especially Lesser Blackbacked Gulls (1,606) in autumn and early winter. Common Gull (310) and Great Black-backed Gull (324) are well represented in winter.

The site is a well-known location for passage waders, especially in autumn. Species such as Ruff, Little Stint, Curlew Sandpiper, Green Sandpiper and Spotted Redshank occur annually though in variable numbers. Small numbers of Ruff may also be seen in late winter and spring. Rarer waders, such as Wood Sandpiper and Pectoral Sandpiper, have also been recorded.

While relatively small in area, Ballycotton Bay supports an excellent diversity of wintering waterfowl and has nationally important populations of nine species, of which two, Golden Plover and Bar-tailed Godwit, are listed on Annex I of the E.U. Birds Directive. Bird populations have been well-monitored in recent years. (NPWS, 2004).

### 4.5 Identification of potential impacts

#### 4.5.1 Direct habitat loss or habitat degradation during construction

The proposed development site and immediately adjoining shoreline habitats, which will be affected by the construction of the proposed development, including the proposed beach nourishment works, do not lie within any designated Natura 2000 site.

Beach nourishment is a well-recognised coastal engineering solution worldwide. It is a soft solution and will not significantly affect the areas in the vicinity of the site. The net coastal sediment transport goes from south to north according to wind conditions and swell and, therefore, the material is likely to move towards the north in the medium and long term. The Cork Harbour Special Protection Area (SPA) is located to the south west of the site therefore the sacrificial material will not impact on the SPA.

***Cork Harbour SPA***

Although impacts during construction on estuarine mudflats of high value for wintering birds listed as qualifying interests for the Cork Harbour SPA are extremely unlikely, such impacts cannot be entirely discounted in the absence of mitigation.

***Great Island Channel cSAC***

Given the dilution provided in the harbour, the distance from qualifying habitats for the Great Island Channel cSAC and the robust nature of these habitats, any minor increases in silt in surface run-off, minor spills of hydrocarbons or other chemicals during construction or fire related impacts will have a negligible impacts on qualifying habitats for this cSAC.

***Ballycotton Bay SPA and Sovereign Islands SPA***

No potential impacts on the Ballycotton Bay SPA or Sovereign Islands SPA during the construction phase have been identified due to their distance from the proposed

development site and the absence of potential ecological pathways by which impacts could occur.

### 4.5.2 Disturbance or displacement of birds during construction, operation and cumulative impacts

***Cork Harbour SPA***

Construction and beach nourishment works will generate additional noise and activity which could lead to the short-term disturbance/displacement of birds. During operation there will be increased traffic and human activity associated with the site. There could also be in-combination impacts due to the presence of other developments in Cork Harbour.

The shoreline habitats in proximity to the proposed development site are not considered of high value for birds listed as qualifying interests for the Cork Harbour SPA. However some of these species were noted overflying the channel that separates the site from Spike Island or were recorded feeding along shoreline habitats. Whilst direct disturbance of qualifying species within the SPA boundary are extremely unlikely, disturbance of such birds where they occur outside the SPA boundary cannot be entirely discounted without more detailed consideration.

***Great Island Channel cSAC, Ballycotton Bay SPA and Sovereign Islands SPA***

No potential impact on the Ballycotton Bay SPA or Sovereign Islands SPA have been identified due to their distance from the proposed development site. Disturbance of birds is not relevant to the Great Island Channel cSAC which was designated on the basis of habitats.

### 4.5.3 Bird collision risk during operation and cumulative impacts

***Cork Harbour SPA***

Structures adjacent to the estuarine environment have the potential to create a collision risk under certain circumstances. The highest buildings at the site of the proposed development will be the main process building (between 23.7-50.7m AOD) and the stack (75 m AOD). Buildings at the site of the proposed development could potentially affect birds via increased collision risk. Bird collisions, if of sufficient magnitude, could potentially impact on the Cork Harbour SPA. There are a number of tall structures within the wider Cork Harbour area including wind turbines, other stacks etc. and, potentially, cumulative impacts could occur which, in turn, could impact on the Cork Harbour SPA.

***Great Island Channel cSAC, Ballycotton Bay SPA and Sovereign Islands SPA***

No potential impacts on the Ballycotton Bay SPA, or Sovereign Islands SPA have been identified due to their distance from the proposed development site and there is no evidence to indicate that the proposed development site lies within a migration route to these sites. Collision is not relevant to the Great Island Channel cSAC which was designated on the basis of habitats.

### 4.5.4 Emissions to water during operation

***Cork Harbour SPA and Great Island Channel cSAC***

In respect of the possible impacts from emissions of pollutants from the facility, it is noted that no significant aqueous discharge into the marine environment is proposed from the resource recovery facility during operation. Any process effluent will be recycled for use in the process and will not be discharged off site. Storm water will be monitored and

discharged off site only if monitoring determines that it is uncontaminated. Given the dilution provided in the marine environment and the distance from the facility to the Cork Harbour SPA and Great Island Channel cSAC, adverse impacts from the discharge of storm water on Natura 2000 sites can be ruled out. Given the distance involved no impact on the Ballycotton Bay SPA and Sovereign Islands SPA will occur.

Wastes, fuel and liquid and solid process materials will be delivered to site by truck via the N28 and the L2545. All Trucks carrying solid waste will be covered. Aqueous waste will come in tankers. All trucks will have to comply with the road transport legislation and regulations. The closest part of the Cork Harbour SPA to the N28 is Monkstown Creek. The N28 is several hundred metres from Monkstown Creek. The L2545 is nearly 1km from the Cork Harbour SPA at Loughbeg. A release from a truck, which is on the road network and conveying material to the site, will not reach the Cork Harbour SPA or other Natura 2000 sites, so no impact on Natura 2000 sites will occur.

### 4.5.5 Emissions to air.

***Cork Harbour SPA***

The impacts on air quality from emissions are specifically addressed in **Appendix 11** to this NIS**.** It is concluded that, based on the results of air dispersion modelling of process emissions, the air quality impact of the proposed facility will be insignificant. This appraisal incorporated all significant potential cumulative impacts.

Notwithstanding the low risk created by emissions, a theoretical pathway, which could impact on ecology, is the aerial deposition of chemicals with ecotoxicological properties such as dioxin or mercury onto marine sediments. Bioaccumulation of such deleterious chemicals could then potentially occur. Generally the impacts, if any, would affect fauna higher up the food chain such as piscivorous birds, some of which are listed as qualifying interests for the Cork Harbour SPA (Common Tern, Cormorant, Red Breasted Merganser, Little Grebe, Great Crested Grebe and Grey Heron). Impacts on the Cork Harbour SPA as a result of air emissions and bioaccumulation, although highly unlikely, could potentially occur.

***Great Island Channel cSAC, Ballycotton Bay SPA and Sovereign Islands SPA***

As set out in **Appendix 11,** in relation to spatial impacts*,* the modelling results, using both the USEPA regulatory model AERMOD and the more advanced CALPUFF model, indicate that the maximum ambient ground level concentration occurs at or near the facility's northern and north-eastern boundaries. The spatial impact of the facility is limited with concentrations falling off rapidly away from the maximum peak. Therefore, no potential impact from emissions, or subsequently from bio-accumulation, on the Ballycotton Bay SPA or Sovereign Islands SPA can occur due to their distances (18.4km and 19.7km respectively) from the proposed development site and the low level of emissions proposed. The Great Island Channel cSAC is located approximately 5km from the proposed development and is designated on the basis of habitats rather than species. Thus direct impacts via bioaccumulation do not arise and potential impact from direct emissions on these designated sites can be ruled out.

### 4.5.6 Potential Accidental Releases from fire during operation

***Cork Harbour SPA***

A Hazard Identification and Risk Assessment Study (**Appendix 13**), examined the operation of the proposed Ringaskiddy resource recovery centre in the context of the Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC [the the 'Seveso III Directive']. This directive is

implemented in Ireland by the Chemicals Act (Control Of Major Accident Hazards Involving Dangerous Substances) Regulations, 2015 [S.I. 205 of 2015]. The study concluded 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.

Notwithstanding the fact that the proposed development will not be a major accident establishment, a number of accident scenarios which could arise during the operation of the facility, 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. A fire in the bunker will result in the emissions to air of the products of the combustion and thermal radiation. Contamination by fire water will not occur as the bunker and the recovery tanks will be designed as water retaining structures.

Whilst impacts on the Cork Harbour SPA are considered unlikely, they cannot be entirely discounted due to the relative proximity of the proposed development site.

***Great Island Channel cSAC, Ballycotton Bay SPA and Sovereign Islands SPA***

No potential impact on the Ballycotton Bay SPA or Sovereign Islands SPA will occur due to their distance from of the proposed development site and the low levels of proposed emissions. The Great Island Channel cSAC is located approximately 5km from the proposed development site and is designated on the basis of robust estuarine habitats. No appreciable impact on the qualifying interests of this designated site will occur.

### 4.5.7 Disposal of bottom ash

Circa 52,664 tonnes per annum of bottom ash will be produced in the waste-to-energy plant. The bottom ash will consist of silicates, minerals and glass compounds. All trucks leaving the facility, carrying bottom ash, will be securely covered. From experience of operating similar facilities in Meath, Ireland and Flanders, Belgium, it is anticipated that the bottom ash will be non-hazardous for handling and for transport.

Bottom ash from waste incineration in EU countries, including Belgium, is used in road construction or as railway ballast. Although there is no Irish or European legislation or standards governing the quality of ash for use in roads, if the ash is to be used for road construction, it must generally be of better quality than if it were to be disposed of in a landfill. This improvement in quality can be achieved by treating the ash in an ash recovery plant. If an ash recovery plant is constructed in Ireland it would be the intention of Indaver Ireland to proactively identify potential uses for the bottom ash. If no market can be found for the bottom ash, it will be disposed of to a suitably licensed landfill site for non-hazardous waste. The bottom ash, produced in Indaver's Carranstown, Co Meath facility has been tested. The bottom ash from the Meath waste-to-energy facility has been classified as non hazardous and non toxic to the aquatic environment according to EPA methodology and Commission Regulation (EU) No. 135/2014.and Commission Decision 2014/955/EU. The bottom ash has been tested since 2011 and to date there has been no change in the classification.

Fifty-five loads per week of bottom ash will be removed from the site via standard covered trucks. The bottom ash will pose no risk to the Cork Harbour SPA during transport from the site as it is transported on the L2545, the N28 and onwards to its final destination on the road network. The closest part of the Cork Harbour SPA to the N28 is Monkstown Creek. The N28 is several hundred metres from Monkstown Creek. The L2545 is nearly 1km from the Cork Harbour SPA at Loughbeg. A release from a truck, which is on the road network and conveying bottom ash from the site, will not reach the SPA or have a negative effect on

it. The bottom ash will be disposed of in a licensed facility or reused in road or rail construction. The EPA can only license the disposal of bottom ash in a facility, if the activity will not have a significant effect on the environment. As noted above the bottom ash from the Meath waste-to-energy facility has been classified as non hazardous and non toxic to the aquatic environment and a similar classification will pertain to the bottom ash producted at the Cork Facility. In this context no potential adverse impacts on Natura 2000 sites from the disposal of bottom ash have been identified.

### 4.5.8 Disposal of Boiler Ash and Flue Gas Cleaning Residues

Circa 2,000 tonnes per annum of boiler ash and circa 9,104 tonnes per annum of flue gas cleaning residues will be produced in the waste-to-energy plant. The boiler ash and flue gas cleaning residues will be in the form of fine particles and will contain heavy metals.

These residues will be disposed of to a landfill for hazardous waste after treatment if necessary or recovered to a salt mine, either in Ireland, if one is available, or abroad. The shipping containers used for such transport are designed and operated in line with international standards. The regulation of the transport of the ash would be subject to Trans Frontier Shipment (TFS) licence which is a licence which must be approved by the origin/destination/transit authorities consenting to the movement/transit and acceptance of wastes between EU member states. The regulation governing this is EU Regulation 1013/2006. This licence tracks waste from origin to destination and ensures that each authority is aware of the status of the waste until final recovery when the individual TFS notification annex consigned with each shipment is signed off as having been received and treated by the receiver. This completed licence is then circulated back to Indaver as the producer as well as all relevant authorities.

Similar residues from Indaver's Meath facility are currently being shipped to salt mines in Germany where the residues are solidified and used to back-fill the mine instead of using other raw materials. There are no hazardous landfills or salt mines in Ireland at present. The residues will be collected on the site in sealed silos (See **Photo 1** below). The silos are emptied into a tanker via a sealed connection. This will ensure there are no fugitive releases on the site.

**Photo 1 Sealed silos**

**Photo 2 Loading area and tanker**


Two container truck loads per week of boiler ash and seven to eight container truck loads per week of flue gas cleaning residues will be removed from the site. The ash and residue containers will be taken to a port, loaded onto a ship and shipped to Rotterdam, or another container port in Europe. From the port of entry the containers will be transported by road to the final destination.

If the residues are disposed of in Ireland, then the residues may be pre-treated on site prior to dispatch. The pre-treatment process will consist of a simple batch mixer which will mix water with the residues. They will be discharged into $1m^3$ FIBC bags to solidify prior to dispatch off-site. The equipment will be located close to the flue gas residue silos within the main process building on the south side. The solidification process will take between 4 and 6 hours.

It is noted that the accident risk during shipping of the boiler ash and residues is low. Van Den Bosch are the preferred international logistic services provider which transports such residues for Indaver. They note that in the 51 years of their history no container has ever fallen overboard and no ship has sunk with their containers on board.

As noted above the addition of water leads to the residues solidifying. Thus, in event of a shipping accident and if the transport container were to loose integrity, the residues would solidify on contact with water and solidified residues will be salvaged from the sea bed.

Given the extremely low risk of an accident, the low risk of leakage from the transport containers, the fact that the residues will solidify on contact with water, no appreciable impacts on Natura 2000 sites along the shipping route from the disposal of this material will occur.

### 4.5.9 Potential Trans-boundary effects - Flue gas cleaning residues disposal and boiler ash in salt mine or landfill in Europe

As noted above, the transport and disposal and recovery of flue gas cleaning residues disposal and boiler ash does not constitute a risk to any designated Natura 2000 sites during transport. The final destination is likely to be a salt mine in Germany, in which the boiler ash and flue gas cleaning residues will be used as backfill. Such an operation must be approved by the relevant competent authorities. The German authorities are subject to current EU legislation including the Habitats Directive, which requires the consent authority for any project which has the potential to have a negative effect on a Natura 2000 site, and which is

not directly connected with or necessary to the management of the site, to undertake an appropriate assessment. The Hattorf facility, which is the proposed final destination of the flue gas residues from Ringaskiddy, has been approved by the relevant competent authority. The letter of confirmation is attached as **Appendix 19.** There will be no appreciable impacts on Natura 2000 sites from disposal of these residues.

### 4.5.10 Potential Impact from increased predator density or activity or changes in predator behaviour.

***Cork Harbour SPA, Great Island Channel cSAC, Ballycotton Bay SPA and Sovereign Islands SPA***

Local ecological impacts could arise due to increased predator activity if species such as rats or gull species were attracted into the local area due to the presence of waste. Both species can predate on nests for ground nesting birds such as common tern. It is noted that trucks with organic waste discharge their loads within a sealed building and that there will no storage of waste in outside spaces. Trucks are inspected on arrival to ensure that there is no waste adhering to wheels. A standard pest control programme will be implemented at the site. It is also noted that the closest nesting colony of high conservation value (common terns) is located approximately 750m away from the Indaver site. This colony is not located within a Natura 2000 site. There will be no ledges suitable for predatory species on the proposed stack. Under these circumstances, any impact on birds listed as special conservation interests for the Cork Harbour SPA from increased predator density or increased predator activity is predicted to be negligible. There will be no appreciable impacts on the Cork Harbour SPA, Ballycotton Bay SPA, Great Island Channel cSAC or Sovereign Islands SPA due to the absence of a risk to bird species listed as special conservation interests for the Cork Harbour SPA.

### 4.5.11 Impact from flooding and erosion and possible impacts from climate change

Flooding of the site could introduce deleterious chemical substances into surface water with the potential impacts on the marine environment. Coastal erosion could lead to structural damage. The project has been specifically designed to minimise such risks and resilience to climate change has been built into the project design as follows.

***Site levels within the Indaver site***

The ground levels of the Indaver site will be raised to alleviate localised flooding issues. Based on the precautionary principle, climate change scenarios have been considered in the modification of levels and the site design. The minimum levels of the site will be raised to 4.55m OD. This level will offer a very high standard of flood protection to the site. For climate change, the OPW Draft Guidance on the “Assessment of potential future scenarios for Flood Risk Management” suggests the use of two scenarios; a mid-range future scenario (MRFS) and a high end future scenario (HEFS). The MRFS represents a likely future scenario which is within the bounds of the widely accepted projections. The HEFS is a more extreme, but plausible future event, and is within the upper bounds of the widely accepted projections. The proposed 1.05m allowance for climate change allows for the high end future scenario. It was decided to use an even more conservative site flood defence level of 4.55m OD given that that a number of recent developments close to the site in Ringaskiddy (Beaufort Research Laboratory and IMERC) have already utilised this level. The 4.55m OD level will offer a very high standard of flood protection to the site. The ground floor level of most of the waste-to-energy plant will be at 5mOD. The floor level of the bunker will be 0mOD. The bunker, and any tanks constructed below 5mOD, will be of watertight concrete construction and will be impermeable.

***Coastal Protection*** The coastline, which forms the eastern boundary of the site, was found to have eroded over the past 100 years at varying rates. Rates identified from historical datasets have been extrapolated to give future conservative retreat rates of up to 36 or 55m over 100 years.

The proposed waste-to energy facility, with a design life of 25 to 30 years, has been located far enough away from the edge of the cliff to ensure that the development will not be impacted by the predicted retreat rates over the 25 – 30 design life. The possibility of impact in a further 30 year period would need to be assessed at the time of considering any application to extend the life of the facility. Never the less, it is proposed that approximately 1,100$m^3$ of sacrificial material, comprising shingle of appropriate size and rounded shape, will be deposited on the beach in the area extending from the car park at the north-eastern corner to the southern boundary of the Indaver site.

The sacrificial material has been designed to remain on site and help lower the natural erosion rate over a number of years. However, the length of time that the material remains in place will depend on the occurrence of extreme wave events which are impossible to forecast. The sacrificial material and the cliff face will be monitored and the sacrificial material will be replenished as required

The proposed protection measures are a soft solution and will not significantly affect the adjoining areas of coastline in the vicinity of the site. The net coastal sediment transport will go from south to north according to wind conditions and swell. Therefore the material is likely to move towards the north in the medium and long term. The Cork Harbour Special Protection Area (SPA) is located to the south west of the site. The sacrificial material will not impact on the SPA.

***L2545 Road Upgrade***

The principal design objective for the upgrade of the L2545 road is to improve the surface water drainage so that the road does not flood after prolonged rainfall and to raise the level of the road above the 1:200 year tidal event and to allow for climate change. The proposed road drainage network upgrade will extend along the entire northern boundary of the Indaver site. It has been designed to cater for the 6.5 hours when the storm water outfall is tide locked and a 1 in 100 year rainfall event plus an allowance for climate change. The increased storage will be in the form of oversized pipes placed underneath the road.

**Grid Connection**

The proposed development will be connected to the 38kV substation, which is located on the eastern side of the Hammond Lane premises, adjacent to the Indaver site. The connection will be via an underground trench.

**Raising the level of the Western Field**

The levels of a portion of the western field, i.e. the field which lies to the west of the entrance Hammond Lane premises, will be raised above the one in 200 year flood level.

***Conclusions Impact from flooding and erosion and possible impacts from climate change***

There will be no significant potential impact due to flooding or coastal erosion for the Cork Harbour SPA, Ballycotton Bay SPA, Great Island Channel cSAC or Sovereign Islands SPA due to their distance from the proposed development site and the absence of significant predicted impacts. It is noted that that measures have been put in place to prevent erosion and flooding. Thus the proposed development will prevent erosion and flooding that would otherwise occur.

### 4.5.12 Potential Cumulative impacts

The potential for in-combination impacts to occur needs to be taken into account. Plans and projects which are considered relevant, for the purposes of assessing cumulative impacts, include the following:

- **Hammond Lane Metal Company**

The existing Hammond Lane Metal Company is accessed from the N28 and is surrounded by the Indaver site. There is existing noise and activity associated with the site.

- **Wind turbines within the Lower Cork Harbour**

Currently in the Cork Lower Harbour there are three existing wind turbines and a further turbine has planning permission. Each turbine has a maximum rotor tip height of 150m. The closest turbine is located approximately 400m south of the proposed stack for the Ringaskiddy Resource Recovery centre at the DePuy facility (Loughbeg). The other constructed wind turbines are located at GlaxoSmithKline (Curraghbinny) and at Janssen (Barnahely), located 1.7km and 2.5km from the proposed Indaver stack, respectively. The fourth turbine, for which Novartis site has planning permission, is similar to the three existing turbines. DePuy Synthes has announced its intention to apply for planning permission to erect a turbine at Loughbeg, on the site which formerly was the Pfizer tableting plant. This turbine is expected to be similar to the three turbines existing turbines in Ringaskiddy. The proposed turbine will be located to the south of the existing turbine, and is expected to be at least 1km from the proposed stack on the Indaver site. It is expected that a planning application for the proposed wind turbine will be submitted to Cork County Council in December 2015.

- **Power Station Stack, at Whitegate**

Approximately 5km east of the proposed development is the ESB Power Station Stack, at Whitegate, with a height of 152m.

- **The Port of Cork redevelopment**

The Port of Cork redevelopment will be located approximately 700m from the proposed development. Increased noise and disturbance are likely to occur during development and operation of this facility.

- **Haulbowline Development and Masterplan**

Remediation works and the subsequent redevelopment of Haulbowline Island, which is located 870m north of the proposed development, could potentially increase traffic levels along local roads.

- **Spike Island Masterplan**

Increased boat traffic to Spike Island and increased activity on the island, which is separated from the Indaver site by a 770m marine channel, could potentially impact on bird populations.

- **M28 Cork to Ringaskiddy Upgrade Scheme**

Increased noise and activity levels could arise due to the proposed M28 scheme, particularly during construction.

- **IMERC Campus Masterplan area**

A Masterplan for the Irish Maritime and Energy Resource Cluster (IMERC) adjacent to the National Maritime College of Ireland (NMCI) aims to deliver research and enterprise campus in Ringaskiddy,Cork. Construction of the Beaufort Building was completed by UCC in 2015.

It is proposed to expand the campus and to develop a marine and energy cluster focussing on research, development, commercialisation and innovation.

Although unlikely to occur, in-combination impacts could potentially impact on the Cork Harbour SPA due to its relative proximity to these proposed and existing developments.

There will be no likely significant cumulative or in-combination impacts on the Ballycotton Bay SPA or Sovereign Islands SPA due to their distance from the proposed development site and the absence of ecological pathways.

The Great Island Channel cSAC is located approximately 5km from the proposed development and is designated on the basis of habitats rather than species. There will be no potential cumulative or in-combination impacts on this designated site.

### 4.6 Screening Conclusion

Theproposed project is not directly connected with or necessary to the management of any Natura 2000 site. It is, accordingly, necessary for the competent authority to assess whether the proposed development, either individually or in combination with other plans or projects, would be likely to have significant effects on any Natura 2000 site.

As set out in detail in this Stage One Screening Report, the likely significant impacts on Natura 2000 sites within a 20km radius of the proposed development have been considered. The use of a 20km radius was adopted as a precautionary measure as impacts at or beyond this distance are extremely unlikely.

Four Natura 2000 sites are located within 20km of the proposed development site namely Cork Harbour SPA (0.5km to the south), Great Island Channel SAC (5km to the north) and the Ballycotton Bay SPA 18.4km east and Sovereign Islands SPA 19.7km southwest.

A precautionary approach has also been adopted in relation to the appraisal of whether the proposed development is likely to have significant impacts on these four sites. Any significant potential impacts were identified and, unless such impacts could be discounted with certainty, it has been determined that a Stage 2 appropriate assessment should be carried out.

The conclusions in respect of each site are as follows.

#### 4.6.1 Potential impacts on the Ballycotton Bay SPA and Sovereign Islands SPA.

Given the low levels of emissions from the proposed development and the distance of these Natura 2000 sites from the proposed development site, no significant potential impacts, whether direct, indirect or cumulative, will occur.

#### 4.6.2 Potential impacts on the Great Island Channel cSAC.

The Great Island Channel SAC (0.5km from the proposed development site) is designated on the basis of two qualifying Annex 1 habitats namely Mudflats and sandflats not covered by seawater at low tide and Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*). No faunal species are listed as qualifying interests for this site and thus potential impacts from collision risk or bioaccumulation to higher trophic levels do not apply. These estuarine

habitats are robust and any impacts from minor accidental discharges of silt or hydrocarbons during construction or emissions during operation will have a negligible impact. Therefore no appreciable impacts from operational emissions, construction or direct removal of habitat, or disturbance will arise. Similarly no significant potential impacts from accidents such as fires during construction or operation or from shipping accidents whilst transporting ash and flue gas residues will occur.

### 4.6.3 Potential impacts on the Cork Harbour SPA

Although it is considered improbable that significant impacts will occur, the likelihood of significant potential impacts on the Cork Harbour SPA with respect to the following, cannot be entirely discounted without further analysis.

1. **Disturbance/displacement of birds listed as qualifying interests for the Cork Harbour SPA where they occur outside the SPA boundary including potential cumulative impacts**
2. **Potential for collision risk for birds listed as qualifying interests for the Cork Harbour SPA where they occur outside the SPA boundary including potential cumulative impacts**
3. **Potential Accidental Releases from the Site During the Construction Phase including cumulative impacts**
4. **Potential Accidental Releases from fire during operation including cumulative impacts**
5. **Potential for bioaccumulation and impacts on piscivorous birds from air emissions of mercury and dioxins**

Therefore in line with a precautionary approach, a Stage 2 Appropriate Assessment of the proposed development is considered necessary in respect of the Cork Harbour SPA. It is also noted that during consultation with the NPWS queries were raised in relation to particular aspects of the development (**See Section 3.3).** These queries are further addressed within the Stage 2 of this NIS.

## 5. Stage 2 – Appropriate Assessment

In carrying out an appropriate assessment under Article 6(3) and section 177V, the competent authority (i.e., the Board) is obliged to make a determination as to whether or not the proposed development would adversely affect the integrity of the relevant European site (i.e., the Cork Harbour SPA) in view of its conservation objectives. Accordingly, an appropriate assessment of the implications for the Cork Harbour SPA of the proposed development implies that, prior to its approval, all the aspects of the proposed development which can, by themselves or in combination with other plans or projects, affect the Cork Harbour SPAs conservation objectives must be identified in the light of the best scientific knowledge in the field.

### 5.1 Cork Harbour SPA Conservation objectives

As concluded in Section 4, and adopting a precautionary approach, the only Natura 2000 site in respect for which it is considered that a Stage 2 Appropriate Assessment is required is the Cork Harbour SPA (Site code 004030). A site synopsis (NPWS, 2008) and conservation objectives (NPWS, 2014) are provided below.

**Conservation objectives**
The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site. The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The qualifying interests and specific conservation objectives for the Cork Harbour SPA are detailed in *NPWS (2014) Conservation Objectives: Cork Harbour SPA 004030*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. These are listed in **Table 7.**

**Table 7. Cork Harbour SPA – Special Conservation Interests for Cork Harbour SPA and species specific conservation objectives.**

| **Cork Harbour SPA [IE0004030] SCIs** | | **Season** | **Conservation Objectives (2014)** |
|---|---|---|---|
| Little Grebe | *Tachybaptus ruficollis* | Wintering | Maintain population |
| Great Crested Grebe | *Podiceps cristatus* | Wintering | Maintain population |
| Cormorant | *Phalacrocorax carbo* | Wintering | Maintain population |
| Grey Heron | *Ardea cinerea* | Wintering | Maintain population |
| Shelduck | *Tadorna tadorna* | Wintering | Maintain population |
| Wigeon | *Anas penelope* | Wintering | Maintain population |
| Teal | *Anas crecca* | Wintering | Maintain population |
| Pintail | *Anas acuta* | Wintering | Maintain population |
| Shoveler | *Anas cylpeata* | Wintering | Maintain population |
| Red-breasted Merganser | *Mergus serrator* | Wintering | Maintain population |
| Oystercatcher | *Haematopus ostralegus* | Wintering | Maintain population |
| Golden Plover | *Pluvialis apricaria* | Wintering | Maintain population |
| Grey Plover | *Pluvialis squatarola* | Wintering | Maintain population |
| Lapwing | *Vanellus vanellus* | Wintering | Maintain population |
| Dunlin | *Calidris alpina* | Wintering | Maintain population |
| Black-tailed Godwit | *Limosa limosa* | Wintering | Maintain population |
| Bar-tailed Godwit | *Limosa lapponica* | Wintering | Maintain population |
| Curlew | *Numenius arquata* | Wintering | Maintain population |
| Redshank | *Tringa totanus* | Wintering | Maintain population |

| | | | |
|---|---|---|---|
| Black-headed Gull | *Larus ridibundus* | Wintering | Maintain population |
| Common Gull | *Larus canus* | Wintering | Maintain population |
| Lesser Black-backed Gull | *Larus fuscus* | Wintering | Maintain population |
| Common Tern | *Sterna hirundo* | Breeding | Maintain population |
| Wetlands & Waterbirds | | | Maintain population |

* Indicates a priority species under the Habitats Directive.

## 5.2 Appraisal of Potential Significant Impacts - Disturbance/displacement of birds listed as qualifying interests for the Cork Harbour SPA where they occur outside the SPA boundary including potential cumulative impacts

### 5.2.1 Potential noise/disturbance impacts during construction

The schedule for the construction and commissioning of the resource recovery centre is approximately 31 months and thus works will occur during the main wintering season for birds in Cork Harbour (October to March inclusive). Night-time works are likely to take place over a period of 6 to 8 weeks. The likely construction activities during this period will involve concrete pours for foundations, retaining walls etc.

The road upgrade will take circa 8 weeks to complete and it is anticipated that the upgrade of the road and the upgrade of the road drainage system will proceed in advance of the construction of the resource recovery facility.

The placement of sacrificial beach material will take approximately three weeks to complete and it is envisaged that it will be undertaken towards the end of the construction phase. Deliveries of shingle (sacrificial material) for the coastal protection works will take place over a period of two weeks. Placing of sacrificial beach material will take place outside the main wintering season for birds (October to March).

Due to the nature of the activities undertaken on a large construction site, there is potential for the generation of high levels of noise to the surrounding environment. A variety of items of plant will be in use depending on the construction phasing. There will also be vehicular movements to and from the site that will make use of existing roads.

The potential for vibration will be limited to vibration as a result of excavation works, rock breaking, piling operations and lorry movements on uneven road surfaces. The most potentially significant of these will be the vibration associated with rock breaking and piling operations. No blasting is proposed.

Disturbance stimuli can divert time and energy from other fitness-enhancing activities such as feeding, parental care, or mating displays. In other words, disturbance signifies a deviation in an animal's behaviour from patterns occurring without human influences. It is generally accepted that disturbance can cause temporary changes in behaviour of migratory and wintering waterfowl. However birds can and often do compensate for this disturbance by altering their behaviour or habituating to human activities.

The closest part of the Cork Harbour SPA is located approximately 0.5 km south of the proposed development area and no impacts on birds within the SPA from increased noise and activity during construction are predicted. A total of thirteen species listed as qualifying interests for the Cork Harbour SPA were recorded, namely, Cormorant, Oystercatcher, Dunlin, Curlew, Redshank, Greenshank, Great Crested Grebe, Grey Heron, Teal, Black headed Gull, Common Gull, Lesser Blackbacked Gull and Common Tern. However, none of these species were recorded in nationally significant numbers in proximity to the site, with relatively small numbers recorded feeding along the rocky shoreline or overflying the

channel. The shoreline in proximity to the proposed development site consists primarily of rocky shore/shingle habitat and lacks the large estuarine mudflats which are of high value for wintering birds. A breeding colony of Common tern and a colony of tree roosting cormorants are located 750m and 1km from the Indaver site respectively.

Notwithstanding the lack of high quality feeding habitat, recreational usage may already be impacting on bird usage of Gobby Beach, which is the shoreline adjacent to the site eastern boundary. It is noted that this beach is subject to high levels of disturbance from recreational users with or without dogs during daylight hours.

### 5.2.2 Mitigation Measures during construction

***Mitigation Measures – Noise & Vibration***

The following mitigation is proposed with respect to noise during construction.

During out of hours construction periods or other construction scenarios with high potential for noise and vibration generating activities, best practice noise and vibration control measures will be employed by the contractor. The best practice measures set out in BS 5228 (2009) Parts 1 and 2 will be complied with. This includes guidance on several aspects of construction site mitigation measures, including, but not limited to the following:

***Selection of quiet plant***

This practice will be in relation to static plant such as compressors and generators. Units will be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected.

***Noise control at source***

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier.

- For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.
- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant will be switched off when not in use and not left idling.
- For piling plant, noise reduction will be achieved by enclosing the driving system in an acoustic shroud, where necessary. For steady continuous noise, such as that generated by diesel engines, it is possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover.
- For percussive tools such as pneumatic concrete breakers, rock drills and tools a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensure any leaks in the air lines are sealed. Further reductions in noise levels will be achieved by erecting localised screens around breakers or drill bits when in operation in close proximity to noise sensitive boundaries.

- For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling, materials will not be dropped from excessive heights. Drops chutes and dump trucks will be lined with resilient materials.
- For compressors, generators and pumps, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation, where required.
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

***Screening***

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. It has been assumed for the purposes of this assessment that a standard construction site hoarding will be erected around the site boundaries. The site hoarding will be constructed of a material with a mass per unit of surface area greater than 7 kg/$m^2$ to provide adequate sound insulation.

In addition, careful planning of the site layout will also be considered. Where feasible, site buildings such as offices and stores will be placed between the source and receiver to provide noise screening.

***Monitoring***

Prior to the construction works commencing on site, environmental noise and vibration monitors will be installed at the selected monitoring locations. The monitoring programme during the constructions works will ensure the effective implementation of the mitigation measures described in the preceding sections.

**5.2.3 Residual construction impacts on the Cork Harbour SPA and special conservation interests for the Cork Habour SPA where they occur in proximity to the Indaver site.**

The application of noise limits, monitoring, and controlled working hours, along with implementation of appropriate noise and vibration mitigation measures as set out above, will ensure that noise and vibration impact is sufficiently controlled to within the relevant criteria. The noise assessment presented in **Appendix 12** notes that noise levels associated with of the Resource Recovery Centre for the worst case construction scenarios assessed are calculated to be less than 35dB $L_{Aeq}$ at the closest areas of the Cork Harbour SPA to the south of the development site. This particular area of the SPA is located in close proximity to a number of existing industrial facilities (i.e. GSK, De Puy and Hovione) with operational noise limits of 55dB $L_{Aeq}$ during daytime periods and 45dB $L_{Aeq}$ during night-time periods. Given that predicted construction noise levels at this location are significantly below the permitted operational noise levels from adjacent facilities, the impact noise impact from construction activities at the closest area of the SPA is insignificant.

All other areas of the Cork Harbour SPA are located at distances beyond 1.5km from the proposed site with lower construction noise levels predicted at these distances, (less than 30dB $L_{Aeq}$) which is well below typical baseline noise levels in the surrounding environment. Taking the above into consideration, the construction phase of the RRC is determined to have no significant impact to the existing noise environment at any of the designated Cork Harbour SPA's.

The breeding colony of common tern is located 750m from the Indaver site and the large night-time roost of Cormorants is located approximately 1km from the Indaver site. Given

that the noise impact during construction will be insignificant at these distances, no adverse impact on the Cork Harbour SPA has been identified.

It is noted that the shoreline habitats in proximity to the Indaver site are not of high value for birds listed as special conservation interests for the this SPA, although some of these species do occur. Disturbance from the proposed development is likely to arise during the construction phase due to increased noise levels. With the exception of limited amount of night-time activity, works will take place during the day when recreational usage of the beach is more likely to be a greater limiting factor for bird usage of the beach.

Night-time works are likely to take place over a period of 6 to 8 weeks. The likely construction activities during this period will involve concrete pours for foundations, retaining walls etc. This short-term night time activity is likely to have a greater impact, as birds feeding during this period may be less habituated to increased noise, activity and lighting, which could lead to some short-term disturbance/displacement of birds during such works. However, as such an impact will be localised and short-term, and given the low value of the shoreline habitats adjoining the site for SPA species, no significant adverse impact on birds listed as qualifying interests for the Cork Harbour SPA, where they occur in proximity to the Indaver site, will occur will occur.

### 5.2.4 Potential noise impacts during operation

Once coastal protection works, road works and building construction works are complete, the main noise sources during the operational phase relate to the operation of the main process building.

There are four key sources associated with the operational phase as follows:

- process and building services plant (fixed installations);
- vehicle movements on site (mobile plant);
- car parking on site, and;
- additional vehicles on public roads.

### 5.2.5 Mitigation measures-operation

The following mitigation is proposed with respect to noise during operation.

Practicable noise control measures will be employed to ensure that noise from process and building services plant do not exceed the specified operational noise levels. Moreover, an acoustic attenuator will be included in the aero condenser structure. In addition to the measures outlined above, the following forms of noise control techniques will be employed as standard to ensure operational plant noise levels are kept to a minimum:

- plant will be sited as far away from noise-sensitive locations as is practicable;
- duct mounted attenuators will be installed on the atmosphere side of all air moving plant;
- splitter attenuators will be installed providing free ventilation to internal plant areas;
- anti-vibration mounts will be installed on all reciprocating plant.

### 5.2.6 Residual operational impacts on the Cork Harbour SPA and special conservation interests for the Cork Harbour SPA where they occur in proximity to the Indaver site.

The noise assessment presented in **Appendix 12** notes that noise levels associated with the operation of the resource recovery centre are calculated to be imperceptible at distances beyond 400 to 500m from the development site. The Indaver site is located 0.5km from the closest point of the Cork Harbour SPA. The breeding colony of common tern is located 750m

from the Indaver site and the large night-time roost of Cormorants is located approximately 1km from the Indaver site. Given that the noise impact during operation will be imperceptible at the relevant distances, no adverse impact on the Cork Harbour SPA has been identified.

The overall noise and vibration impact of the proposed facility during operation is expected to be insignificant in the long term, taking account of the existing noise environment and the predicted impact of the proposal. There will no adverse effect on any bird species listed as special conservation interests for the Cork Harbour SPA, where they occur in proximity to the Indaver site, during the operational phase of the proposed development.

### 5.2.7 Cumulative impacts from noise

The noise assessment presented in **Appendix 12** assessed potential cumulative impacts on the Cork Harbour SPA. It concluded that noise levels associated with the operation of the resource recovery centre are calculated to be imperceptible at distances beyond 400 to 500m from the development site. The closest area of the Cork Harbour SPA is located some 500m to the south of the development site. This particular area of the SPA is located in close proximity to a number of existing industrial facilities (i.e. GSK, De Puy and Hovione) and hence the operation of the resource recovery centre will have no impact on noise levels at this area considering the contribution of these adjacent facilities to the existing noise environment. All other areas of the Cork Harbour SPA are located at distances beyond 1.5km from the proposed site and hence the operation of the resource recovery centre is determined to have no measurable or perceptible change to the existing noise environment at any of the designated Cork Harbour SPA's.

The Indaver site is located 0.5km from the closest point of the Cork Harbour SPA. It is noted that the shoreline habitats in proximity to the Indaver site are not of high value for birds listed as special conservation interests for the this SPA. The nesting colony of Common Tern is located approximately 750m from the proposed Indaver site. The large night-time roost of Cormorants is located approximately 1km from the Indaver site.

Any predicted noise impacts associated with the proposed resource recovery centre are well below those associated with the existing noise environment, and those noise impacts associated with the proposed N28 Link road and the Port of Cork development and other planned projects. Hence, once operational, the proposed resource recovery centre is expected to be imperceptible in terms of noise to its surrounding environment. Potential construction in-combination impacts are not predicted to be significant given the background noise environment at the Indaver site. Based on the above, there will be no adverse effect on the bird species listed as special conservation interests for the Cork Harbour SPA.

## 5.3 Appraisal of Potential Significant Impacts - Potential for collision risk for birds listed as qualifying interests for the Cork Harbour SPA where they occur outside the SPA boundary including potential cumulative impacts

A literature review assessment of the potential for a collision risk for birds created by the type of stack proposed is included as **Appendix 4.** This information is considered in relation to the proposed 75m OD stack below.

Although collisions may occur there are a number of factors, such as total population size, natural mortality levels, and other human related influences, to be considered in order to put the collision mortality factor in proper perspective. Modelling by some authors has found that vulnerability to collision with buildings and towers varied over more than four orders of magnitude among species. Species that migrated long distances or at night, were much more likely to be affected by collisions than year-round residents or diurnal migrants. However, no correlation has been established between relative collision mortality and long-term population trends for these same species.

### 5.3.1 Factors affecting risk of collision

Factors affecting risk of collision which were identified by the literature include the following**:**

***Building height***

There is some evidence to suggest that towers in the lower range (60 m to 150 m) pose a lower risk to migrating birds. The Indaver stack, which will have a height of 75m OD (circa 70m above the ground), will be within this lower range.

***Lighting***

Apart from size, often the most important structural factor related to collision probability is the use of lighting. There are no detailed studies of the different risks posed by different lighting systems, though several studies show that changes in the type of lighting used, particularly the replacement of continuous red or white lights with intermittent lighting, has, in some circumstances, reduced the trapping effect and thus mortality of nocturnal migrants.

The literature review indicates that, while any light source has the potential to attract birds and therefore increase collision risk, flashing lights are involved in significantly fewer collisions that continuous lights. There is also some indication that white lights are less attractive than red lights, although the results to date are inconclusive. While bird vision does differ from human, on the lower ultraviolet end of the spectrum, infrared light is also invisible to birds. The Indaver facility will have white flashing lights, the least risk option for bird collision.

***Location of structure***

The location of a structure can dramatically affect the likelihood of collision mortality. Clearly, structures present a greater risk of collision if placed on or near areas regularly used by large numbers of feeding, breeding, or roosting birds, or on migratory flyways or local flight paths, such as those between foraging and nesting or roosting areas. A recent radar study, which was commissioned by the Cork Lower Harbour Energy Group in order to identify nocturnal bird movement and interconnectivity within the Cork Harbour SPA, indicated that the proposed Indaver stack will not be located on or near any migratory route.

***Differing Species Susceptibility***

Not all bird species are equally susceptible to collision. Gregarious species that form flocks during the autumn and winter appear prone to collision. Flight height is clearly an important factor in collision and varies greatly, depending not only on species and behaviour, but also on topography, season, time of day and weather conditions. Flight distance also affects flight height, with local movements, such as between feeding and nesting or roosting areas, tending to be at low altitude.

***Seasonality***

There appears to be some correlation between seasonality and bird-strikes. This relates mainly to the seasonal movements of birds, with increased incidence of mortality events often occurring during peak migration periods. Higher mortality at this time is perhaps also due to the lack of familiarity of migrant and over-wintering birds with the locations of obstacles, compared with resident individuals. Determining risk based on migrant versus resident status is not straightforward, and mitigating factors, such as familiarity with the presence of structures, must be weighed against factors, such as period of exposure and species (or individual) susceptibility. However, as indicated previously the proposed Indaver stack will not be located on or near any migratory route.

### *Flight characteristics*

Commuting flights between foraging grounds generally take place at a lower altitude (i.e. 0-5 metres) and thus could potentially encounter the buildings of the proposed development. At Ringaskiddy, this is likely to include Cormorants, ducks, some wader species and gulls. However flights such as this are likely to take place within the estuarine habitats (i.e. the open water or mudflats) and not over the landward site of the proposed development.

Some attempts have been made to quantify the risk of wind turbine collision. While this is not entirely comparable to collision risk with static buildings, such as stacks, it does give some indication of relative species risk. **Table 8** lists the bird species of qualifying interest and conservation concern located within Cork Harbour SPA. The vulnerability to collision of each of these species, according the European Commission Guidelines on Windfarms (2010) is also listed. It is most notably the flocking species of Dunlin, Lapwing and Golden Plover which are at potential risk of impact. The higher risk identified for Common Tern is probably associated with their foraging behaviour during breeding seasons.

**Table 8. Bird species of qualifying interest and conservation concern within Cork Harbour SPA**

| | Common Name | *Scientific Name* | Annex of EU Birds Directive | Vulnerability to Collision |
|---|---|---|---|---|
| Qualifying interests | Cormorant | *Phalacrocorax carbo* | n/a | 1 |
| | Shelduck | *Tadorna tadorna* | n/a | 0 |
| | Oystercatcher | *Haematopus ostralegus* | n/a | 0 |
| | Golden Plover | *Pluvialis apricaria* | Annex I | 2 |
| | Lapwing | *Vanellus vanellus* | n/a | 2 |
| | Dunlin | *Calidris alpine* | n/a | 2 |
| | Black-tailed godwit | *Limosa limosa* | n/a | 1 |
| | Bar-tailed godwit | *Limosa laponica* | n/a | 0 |
| | Curlew | *Numenius aquata* | n/a | 0 |
| | Redshank | *Tringa tetanus* | n/a | 0 |
| | Common tern | *Sterna hirundo* | Annex I | 3 |
| Special Conservation Interest | Little grebe | *Tachybaptus ruficollis* | n/a | 0 |
| | Great crested grebe | *Podiceps cristatus* | n/a | 2 |
| | Grey heron | *Ardea cinerea* | n/a | 0 |
| | Wigeon | *Anas Penelope* | n/a | 0 |
| | Teal | *Anas crecca* | n/a | 0 |
| | Pintail | *Anas acuta* | n/a | 0 |
| | Shoveler | *Anas clypeata* | n/a | 0 |
| | Red-breasted merganser | *Mergus serrator* | n/a | 0 |
| | Grey plover | *Pluvialis squatarola* | n/a | 0 |
| | Black-headed gull | *Larus ribundus* | n/a | 0 |
| | Common gull | *Larus canus* | n/a | 0 |
| | Lesser black-backed gull | *Larus fuscus* | n/a | 0 |

4 = Evidence on substantial risk of impact, 3 = Evidence or indications of risk or impact, 2 = Potential risk or impact, 1 = small or non-significant risk or impact, but still to be considered in assessments, 0 = no risk.

### 5.3.2 Mitigation measures

The top of the stack will be indicated by white strobe (flashing) obstacle warning lights. The lights will be incandescent or of a type visible to Night Vision Equipment. The lights will emit light at the near infra-red (IR) range of the electromagnetic spectrum specifically at or near

850 nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.

### 5.3.3 Conclusions

In determining the potential collision risk the following points were taken into consideration:

- A recent radar study was commissioned by the Cork Lower Harbour Energy Group, in order to identify nocturnal bird movement and interconnectivity within the Cork Harbour SPA. A number of significant nocturnal flight corridors were identified, particularly connecting Lough Beg to the Owenboy River Estuary at incoming and outgoing tide periods. This is located to the south of the proposed Ringaskiddy Resource Recovery Centre. No widespread distinct patterns were observed between Monkstown Creek and Lough Beg, although minor patterns were observed from birds flying northwards from Lough Beg over the Martello tower area, to the west of the proposed Ringaskiddy Resource Recovery Centre. No distinct flight patterns were observed over the proposed development site. The location of the proposed stack at Ringaskiddy Resource Recovery centre although 500m from the Cork Harbour SPA, is not a roosting area, or on a significant flightline or migratory path for the birds using the SPA.
- The coastal areas adjacent to the proposed development are not of high value for bird species listed as special conservation interests for the Cork Harbour SPA.
- The nesting colony of Common Tern is located approximately 750m from the proposed Indaver stack. The large night-time roost of Cormorants is located approximately 1km from the Indaver site. The surveys carried out do not indicate that either species have significant flight lines through the Indaver site.
- The proposed stack height is relatively low, at just 75m OD (circa 70m above the ground), a height which has been shown to pose less collision risk than higher wind turbines and communication towers. Migratory flights over the area, would generally occur at a much greater height that 75m OD, thus eliminating or very substantially reducing the collision risk to migratory birds overflying the site of the proposed development.
- The static nature of the stack, compared to wind turbines, means it will create a significantly lower risk of collision.
- The literature review indicates that flashing lights are involved in significantly fewer collisions that continuous lights. There is also some indication that white lights are less attractive than red lights. While bird vision does differ from human, on the lower ultraviolet end of the spectrum, infrared light is also invisible to birds. Therefore the proposal for a combination of white flashing and IR lights on the stack, is the most favourable choice and is unlikely to pose a significant collision risk to birds.
- The potential cumulative impacts of this development, in combination with other developments in the vicinity, are not predicted to result in any adverse effects on the conservation objectives of the Cork Harbour SPA as the stack in the proposed development is located at a sufficient distance from other developments. The closest wind turbine is 400m away and, following radar studies conducted during the planning process for these turbines, no significant cumulative collision risk is predicted. No additional impact is predicted from the new planned turbine at the De Puy site, which will be at least 1km from the Indaver stack.

Based on the above and given the fact that the stack is a static structure, which is relatively low in height and which is not located on or in proximity to significant roosting areas, nesting areas, flight lines or migratory paths for birds, there will not be adverse effects on the constitutive characteristics (i.e., the thirteen bird species) of the Cork Harbour SPA.

Specifically, in light of the best available scientific knowledge, the stack as proposed will not create a collision risk of a magnitude sufficient to adversely impact on the integrity of any of the special conservation interests and/or conservation objectives for the Cork Harbour SPA. Given the distance of the stack from other tall structures including wind turbines, no adverse cumulative effects to the integrity, special conservation interests and conservation objectives for the Cork Harbour SPA will occur.

### 5.4 Appraisal of Potential Significant Impacts - Potential Accidental Releases from the Site During the Construction Phase

Potential accidental releases with a higher risk of occurrence during construction would include the release of silt or mud or a spill of fuel onto the L2545 road or onto Gobby Beach.

#### 5.4.1 Mitigation during construction

A range of easily implemented control measures, will ensure that any risks are minimised as follows:

- To prevent incidental damage by machinery or by the deposition of spoil during the site clearance stage, any trees /habitats earmarked for retention will be securely fenced early in the construction phase. The fencing will be clearly visible to machine operators.
- A dedicated holding tank for storage of construction foul effluent will be constructed prior to commencement of the main construction activities. The effluent will be regularly disposed of off-site by tanker by a licensed contractor to an approved licenced facility
- Storm water will be managed carefully during construction. In general, storm water will be infiltrated to ground via silt traps and managed soakaways. The laydown areas will be suitably drained and any areas which will involve the storage of fuel and refuelling will be paved and bunded and hydrocarbon interceptors will be installed to ensure that no spillages will get into the surface water or groundwater.
- The construction management of the site will take account of the recommendations of the CIRIA guide *Control of Water Pollution from Construction Sites 2001*. Construction mitigation measures are outlined in **Appendix 9**.
- Construction activities have the potential to generate dust emissions, particularly during the site clearance and excavation stages. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with ambient conditions, including rainfall, wind speed, wind direction and on the distance to potentially sensitive locations. Most of the dust would be deposited close to the potential source and any impacts from dust deposition would typically be within 100 metres or so of the construction area.
- The following avoidance, remedial or reductive measures will be implemented as part of the dust minimisation plan:
    - During very dry periods when dust generation is likely, construction areas will be sprayed with water.
    - Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor through regular servicing of machinery.
    - Vehicle speeds will be limited in the construction site.

- Surrounding roads used by trucks for access to and egress from the site will be cleaned regularly using an approved mechanical road sweeper. Roads will be cleaned subject to local authority requirements. Site roads will be cleaned on a daily basis, or more regularly, as required.
- Wheel-wash facilities will be provided with rumble grids to remove excess mud from wheels. These facilities will be located at the exit from the site and away from sensitive receptors, where possible.
- Internal haul roads will be paved at the earliest possible opportunity and inspected regularly for cleanliness.
- Materials carried on vehicles to site will be enclosed or covered with tarpaulins.
- Daily visual inspections will be carried out at locations around the site boundary as required. These inspections will monitor the effectiveness of dust mitigation measures.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind.
- Wheel wash facilities will be provided for vehicles exiting the project site. Wheel wash run off will be stored in an onsite storage tank and will be disposed of by permitted waste haulage company at a permitted or licensed facility.

- Waste generated during the construction phase will be carefully managed according to the accepted waste hierarchy which gives precedence to prevention, minimisation, reuse and recycling over disposal with energy recovery and finally disposal to landfill.
- All waste removed from the site will be collected only by contractors with valid waste collection permits, under the Waste Management (Collection Permit) Regulations 2007 and 2008. All facilities to which waste will be taken will be audited in advance, to ensure that they have appropriate waste licences or permits, under the Waste Management Act 1996, as amended, and the regulations thereunder, allowing them to accept the type of waste that is to be sent there. Hazardous waste generation will be minimised, and such waste will be recovered where feasible, and only disposed of if recovery is not feasible. Hazardous waste will be managed in accordance with the relevant legislation.
- The employment of good construction management practices will minimise the risk of pollution of soil, storm water run-off, seawater or groundwater. The Construction Industry Research and Information Association (CIRIA) in the UK has issued a guidance note on the control and management of water pollution from construction sites, *Control of Water Pollution from Construction Sites, guidance for consultants and contractors* (Masters-Williams et al 2001). Additional guidance is provided in the CIRIA technical guidance on *Control of Water Pollution from Linear Construction Projects* (Murnane *et al* 2006).
    - Measures, as recommended in the guidance above, that will be implemented to minimise the risk of spills and contamination of soils and waters, include:
    - Training of site managers, foremen and workforce, including all subcontractors, in pollution risks and preventative measures,
    - Careful consideration will be given to the location of any fuel storage facilities. These will be designed in accordance with guidelines produced by CIRIA, and will be fully bunded.

- All vehicles and plant will be regularly inspected for fuel, oil and hydraulic fluid leaks. Suitable equipment to deal with spills will be maintained on site.
- Where feasible, soil excavation will be completed during dry periods and undertaken with excavators and dump trucks. Topsoil and subsoil will not be mixed together.
- All areas where liquids are stored or cleaning is carried out will be located within a designated impermeable area that is isolated from the surrounding area, e.g. by a roll-over bund, raised kerb, ramps or stepped access.
- Use collection systems to prevent any contaminated drainage entering surface water drains, watercourses or groundwater, or draining onto the land.
- Minimise the use of cleaning chemicals.
- Use trigger-operated spray guns, with automatic water-supply cut-off.
- Use settlement lagoons or suitable absorbent material such as flocculent to remove suspended solids such as mud and silt.
- Ensure that all staff are trained and follow vehicle cleaning procedures.
- Post details of the procedures in the work area for easy reference.

### 5.4.2 Conclusions - Potential Accidental Releases from the Site During the Construction Phase

In the unlikely event that construction does result in small scale spillages of hydrocarbons or increased silt levels in surface water run-off, the impacts on the marine environment would be limited and localised. Given the dilution provided in the marine environment and the distance of the Cork Harbour SPA from the proposed development such spillages would not have an adverse impact on the integrity of the Cork Harbour SPA or the conservation objectives for qualifying bird species.

The only accidental release from the site during construction, which would have the potential to have a negative effect on the SPA, would be a fire. In such a scenario, combustion products would be released during a fire. It is noted that the risk of fire during construction is low and the impact is also likely to be low as thethis development is industrial in nature with a predominance of steel, concrete and other non-combustible materials in the main process building. Fuel storage on site will be limited to small diesel tanks to supply earth moving plant. Moreover, it is also noted that the Cork Harbour SPA is located 0.5km from the Indaver site and thus any impact on the SPA from a construction fire is predicted to be negligible. Given the dilution provided in the marine environment and the distance of the Cork Harbour SPA from the proposed development, run-off of fire water would not have an adverse impact on the integrity of the Cork Harbour SPA or the conservation objectives for qualifying bird species.

Overall, whilst minor localised impacts on water quality could occur, there will not be an adverse effect on the integrity, special conservation interests and conservation objectives for the Cork Harbour SPA, even in the event of a highly unlikely accidental release from the site during the construction period.

## 5.5 Appraisal of Potential Significant Impacts - Potential Accidental Releases from fire during operation

### 5.5.1 Hazard Identification and Risk Assessment study

Notwithstanding the fact that the proposed development will not be a major accident establishment, a number of accident scenarios which could potentially arise during the operation of the facility, were assessed in the Hazard Identification and Risk Assessment

study to determine the risk each posed to human health and the environment. The only risk identified as substantial was a fire in the bunker.

### 5.5.2 Consequence of Fire in the Bunker

Byrne Ó Cléirigh (Appendix 13) modelled the effects of a fully developed fire in the bunker, which was the only substantial risk identified. The report concluded the following:

Calculations show that "*there is a very wide margin of safety between the expected dioxin intake to people at receptors close to the Indaver site when compared with the WHO's Tolerable Daily Intake (TDI) for lifetime exposure of 1-4 pg/kg/day (taken as 1 pg/kg/day for the purposes of this calculation). As such the overall exposure to dioxins in the surrounding area as a result of the Indaver facility would be very low (over three orders of magnitude less than the overall TDI established by WHO)".*

*"The closest Protected Site to the Indaver facility is Lough Beg, which is part of the Cork Harbour SPA and is also a pNHA. This is located c.500 m from the facility. Applying the same calculations the resulting factor of safety works out as 4,390, based on the WHO criteria for human health*." It is predicted that the dioxin intake level at the closest point of the SPA would be negligible and would not have have an adverse impact on the integrity of the Cork Harbour SPA or the conservation objectives for qualifying bird species.

The thermal radiation from a fully developed fire in the bunker was also modelled. A thermal dose end point of 4kW/$m^2$ is the level sufficient to cause pain to persons exposed if unable to reach cover within 20 seconds. The distance to this thermal dose was 52m. The closest point of the Cork Harbour SPA is approximately 0.5km from the site and well beyond this distance. Accordingly, the thermal dose at the nearest point of the SPA would be well below a level which would affect any of the species identified as the qualifying interests for this SPA.

### 5.5.3 Control Measures to Prevent a Fire in the Bunker

The measures will be put in place to protect against a fire in the bunker, either by reducing the likelihood of occurrence or mitigating the impacts if it did occur:

### 5.5.4 Prevention Measures

- Visual inspection of waste as it is unloaded at the reception hall/tipping hall, to check for any irregularities.
- Hot work permitting system – control on ignition sources in area.
- Trained operators.
- Lower explosive limit (LEL) monitoring in bunker.
- Where practicable, equipment is taken outside of the bunker for maintenance works to protect against risk of fire from maintenance activities.
- Due to the manner in which the activity is carried out, there is a quick throughput at the bunker which means that waste is not left in situ for a long period of time.
- Bunker Management Programme - once or twice per year the level in the bunker is lowered (as far as practicable) in the course of a lead in to plant shut down.
- Barrier in place at waste receipt area, to protect against scenario in which a trailer falls into the bunker.

### 5.5.5. Control Measures if a fire occurs

- In the event of a fire in the bunker, the fire damper will close and air to boiler will be taken from elsewhere.
- The control room is a manned area that has visibility on the bunker at all times via a large window that looks out onto it; this would facilitate rapid detection of smoke formation.

- Negative pressure at waste reception area.
- ultraviolet/infrared detectors in the bunker.
- If smouldering waste is detected it is loaded directly to hopper and more waste is then dumped on top to smother it.
- 4 x fixed water cannons in place to douse spot fires.
- Sprinkler system on roof as back up to the water cannons.
- Bunker is concrete structure.
- Fire wrapping of cables to ensure continued function during fire event.

### 5.5.6 Fire Water Containment

Fire water retention, for the retention and control of contaminated water generated when fighting a fire on site, will be provided to the waste-to-energy plant.

In the event of a fire in the bunker, the water used to fight the fire will be captured in the bunker where it will be stored for disposal. The bunker will have more than adequate capacity for the volume of water used to fight the fire as well as the waste which will be in it. If there is a fire in any other part of the waste-to-energy plant, the water used to fight the fire will be captured by the recovery water and clean water tanks which will be located below the building floor. The bunker and the recovery tanks will be designed as water retaining structures. The fire-fighting water from any fire anywhere else on site will be captured in the storm water drainage system and will be collected in the holding tank, where it can be stored for disposal. The outlet valve from the holding tank will close if there is a fire alarm. If the holding tank has insufficient capacity, the water will overflow to the attenuation tank, in which it can be retained pending testing and disposal.

### 5.5.7 Conclusions - Potential Accidental Releases from fire during operation

A range of mitigation measures will be implemented to prevent a fire in the bunker. Even in the event of a bunker fire the dioxin intake level at the closest point of the SPA would be negligible. Moreover, in the extremely unlikely event of a fire occurring, the thermal dose at the nearest point of the SPA would be well below a level which would affect the any of the species identified as the qualifying interests of the SPA. In the event of a fire in the bunker, the water used to fight the fire will be captured in the bunker, which will have sufficient capacity, where it will be stored for disposal. If a fire occurs in another part of the waste-to-energy building, the water used to fight the fire would be captured in the recovered water and clean water tanks which will be located under the floor. If a fire occurred in an external area, the potentially contaminated water used to fight the fire would drain to the storm water drainage system and be collected in the holding tank. If the holding tank has insufficient capacity, the water will overflow to the attenuation tank, in which it can be retained pending testing and disposal. Accordingly, there will no release of water used to fight the fire to the aquatic environment and no adverse effects on the conservation objectives of the Cork Harbour SPA can occur.

In light of the above evaluation, including the effective implementation of measures to prevent a fire, even if a fire did occur at the facility, such a fire would not have an adverse impact on the integrity of the Cork Harbour SPA site and its conservation objectives. No potential in-combination impacts, in relation to a fire on site, have been identified, which could have an adverse impact on the integrity of the Cork Harbour SPA or the conservation objectives for qualifying bird species.

### 5.6 Appraisal of Potential Significant Impacts - Potential Accidental Releases from fire during operation Potential impacts on piscivorous birds from air emissions and possible bioaccumulation

### 5.6.1 Assessment of potential air and sediment impacts

**Appendix 11** of this NIS provides a detailed assessment of the potential impacts on air. It is noted that due to the localised nature of possible impacts from dust generation during construction, the limited nature of potential impacts and the distance from the Cork Harbour SPA (0.5km) no significant potential impact from dust has been identified. Thus this section is concerned with possible emissions from the operation of the facility.

The Ringaskiddy Resource Recovery Centre will have one furnace and flue gas cleaning line. The line will have a moving grate furnace with a state-of-the-art flue gas cleaning system The combustion of waste produces a number of emissions, the discharges of which are regulated by the EU Directive on Industrial Emissions (IED) (2010/75/EU). The emissions to atmosphere which have been considered are: Nitrogen Dioxide ($NO_2$), Nitrous Oxides ($NO_x$) Sulphur Dioxide ($SO_2$), Total Dust (as $PM_{10}$ and $PM_{2.5}$), Carbon Monoxide (CO), Total Organic Carbon (TOC), Hydrogen Fluoride (HF) and Hydrogen Chloride (HCl), Dioxins/Furans (PCDD/PCDFs), Cadmium (Cd) and Thallium (Tl), Mercury (Hg) and the sum of Antimony (Sb), Arsenic (As), Lead (Pb), Chromium (Cr), Cobalt (Co), Copper (Cu), Manganese (Mn), Nickel (Ni) and Vanadium (V). In addition, Polycyclic Aromatic Hydrocarbons (PAHs) have been assessed as incineration is a potential emission source for this group of compounds.

The scope of the study consists of the following components:

- Review of maximum emission levels and other relevant information needed for the modelling study;
- Identification of the significant substances which are released from the facility;
- Review of background ambient air quality in the vicinity of the facility;
- Air dispersion modelling of significant substances released from the facility;
- Particulate deposition modelling of Dioxins and Furans, Polycyclic Aromatic Hydrocarbons (PAHs) and heavy metals released from the facility;
- Identification of predicted ground level concentrations of released substances at the facility boundary and at sensitive receptors in the immediate environment;
- Evaluation of the significance of these predicted concentrations, including consideration of whether these ground level concentrations are likely to exceed the most stringent ambient air quality standards and guidelines.

#### 5.6.1.1 Modelling Under Maximum & Abnormal Operating Conditions

In order to assess the potential impact from the proposed facility under maximum and abnormal operations, a conservative approach was adopted that is designed to over-predict ground level concentrations. This cautious approach will ensure that an over-estimation of impacts will occur and that the resultant emission standards adopted are protective of ambient air quality. The approach incorporated several conservative assumptions regarding operating conditions at the proposed facility. This approach incorporated the following features:

- For the maximum operating scenario, it has been assumed that the emission point is continuously operating at its maximum operating volume flow. This will over-estimate the actual mass emissions from the facility.
- For the maximum operating scenario, it has been assumed that the emission point is operating at maximum capacity for 24-hrs/day over the course of the full year.

- Abnormal operating emissions were obtained from the process engineer and are pessimistically assumed to occur.
- As a result of these conservative assumptions, there will be an over-estimation of the emissions from the facility and the impact of the proposed facility on the surrounding environment.

#### 5.6.1.2 Modelling Study Methodology

The air dispersion modelling input data consists of detailed information on the physical environment (including building dimensions and terrain features), design details from all emission points on-site and a full year of worst-case meteorological data. The worst-case ambient concentration was then compared with the relevant ambient air quality standard to assess the significance of potential releases from the site. In the absence of detailed guidance from the Irish EPA, the selection of appropriate modelling methodology has followed the guidance from the USEPA which has issued detailed and comprehensive guidance on the selection and use of air quality models. Based on guidance from the USEPA, the most appropriate regulatory model for the current application is the AERMOD model (Version 14134). The selection of the appropriate meteorological data has followed the guidance issued by the USEPA.

#### 5.6.1.3 Background Concentrations

The ambient concentrations detailed in the following sections include both the emissions from the site and the ambient background concentration for that substance. Background concentrations have been derived from a worst-case analysis of the cumulative sources in the region in the absence of the development. A detailed baseline air quality assessment was carried out to assess background levels of those pollutants, which are likely to be significant releases from the site.

#### 5.6.1.4 Cumulative Assessment

As the region around Ringaskiddy is partly industrialised and thus has several other potentially significant sources of pollutants, a detailed cumulative assessment has been carried out using the methodology outlined by the USEPA. The impact of nearby sources should be examined where interactions between the plume of the point source under consideration and those of nearby sources can occur. These include the area of maximum impact of the point source, the area of maximum impact of nearby sources and the area where all sources combine to cause maximum impact on air quality. Background concentrations for the area, based on natural, minor and distant major sources need also to be taken into account in the modelling procedure. A major baseline monitoring programme was undertaken over several months which, in conjunction with other available baseline data, was used to determine worst-case background concentrations in the region. Full detail of the cumulative impact assessment and associated results can be seen in **Appendix 11.**

#### 5.6.1.5 Ambient Air Quality Standards

Ambient air quality legislation designed to protect human health and the environment is generally based on assessing ambient air quality at locations where the exposure of the population is significant relevant to the averaging time of the pollutant. However, in the current appraisal, ambient air quality legislation has been applied to all locations within a 10km radius of the facility regardless of whether any sensitive receptors (such as residential locations) are present for significant periods of time. This represents a worst-case approach and an examination of the corresponding concentrations at the nearest sensitive receptors relative to the actual quoted maximum concentration indicates that these receptors generally

experience ambient concentrations significantly lower than that reported for the maximum value.

#### 5.6.1.6 Receiving Environment

An extensive baseline survey was carried out in the region of the proposed Ringaskiddy Resource Recovery Centre facility over the period August 2014 to July 2015. This supplements the extensive baseline survey undertaken in November 2006 to February 2007 and from April 2008 to July 2008. The surveys focused on the significant pollutants likely to be emitted from the facility and which have been regulated in Council Directive 2010/75/EU. The updated extensive baseline survey which was carried out in the region of the proposed Ringaskiddy Resource Recovery Centre facility over the period August 2014 to July 2015 focused on $NO_2$, $PM_{10}$, benzene, $SO_2$ and heavy metals over a year long period in order to capture any possible seasonal factors.

#### 5.6.1.7 *AERMOD dispersion model*

Council Directive 2010/75/EU on Industrial Emissions (IED) has outlined air emission limit values. The Directive has also outlined stringent operating conditions in order to ensure sufficient combustion of waste thus ensuring that dioxin formation is minimised. Specifically, the combustion gases must be maintained at a temperature of 850°C for at least two seconds under normal operating conditions for non-hazardous waste whilst for hazardous waste containing more than 1% halogenated organic substances, the temperature should be raised to 1100°C for at least two seconds. These measures will ensure that dioxins/furans, polychlorinated biphenyls (PCBs) and PAHs are minimised through complete combustion of waste.

Emissions from the proposed facility have been modelled using the AERMOD dispersion model which is the USEPA's regulatory model used to assess pollutant concentrations associated with industrial sources(1). Emissions have been assessed, firstly under maximum emissions limits of the EU Directive 2010/75/EU and secondly under abnormal operating conditions.

The Ringaksiddy Resource Recovery Centre facility has one main process emission point (flue). In order to assess the possible impact from the proposed facility under maximum and abnormal operations, a conservative approach was adopted that is designed to over-predict ground level concentrations. This cautious approach will ensure that an over-estimation of impacts will occur and that the resultant emission standards adopted are protective of ambient air quality. The approach incorporated several conservative assumptions regarding operating conditions at the proposed facility.

- **$NO_2$ & $NO_X$**

$NO_2$ modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards for nitrogen dioxide under maximum and abnormal operation of the facility. Thus, no adverse impact on the environment is predicted under these conditions at or beyond the facility boundary.

The annual average $NO_X$ concentration (including background concentration) in the Cork Harbour SPA will also be below the limit value for the protection of vegetation. Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA will occur.

- **$SO_2$, CO, $PM_{10}$ & $PM_{2.5}$**

Modelling results indicate that ambient ground level concentrations will be below the relevant air quality standards for sulphur dioxide, carbon monoxide and $PM_{10}$ under maximum and abnormal operation of the facility. Results will also be below the air quality standard for $PM_{2.5}$ under maximum and abnormal operation of the facility. Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA will occur.

**TOC, HCl & HF**

Modelling results indicate that the ambient ground level concentrations will be below the relevant air quality guidelines for the protection for TOC (assumed pessimistically to consist solely of benzene), HCl and HF under maximum and abnormal operation of the facility. Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **PCDD / PCDFs (Dioxins/Furans)**

Currently, no internationally recognised ambient air quality concentration or deposition standards exist for PCDD/PCDFs (Dioxins/Furans). Both the USEPA and WHO recommended approach to assessing the risk from Dioxins/Furans entails a detailed risk assessment analysis involving the determination of the impact of Dioxins/Furans in terms of the TDI (Tolerable Daily Intake) approach. The WHO currently proposes a maximum TDI of between 1-4 pgTEQ/kg of body weight per day. Background levels of Dioxins/Furans occur everywhere and existing levels in the surrounding area have been extensively monitored as part of this study. Monitoring results indicate that the existing levels are similar to rural areas in the UK and Ireland. The contribution from the facility in this context is minor, with levels at the worst-case receptor to the north-west of the facility (at a distance of approximately 400 metres from the nearest point of the Cork Harbour SPA), under maximum and abnormal operation, accounting for less than 6% of the ambient air quality standards under maximum operating conditions.

There will be no adverse effects on the conservation objectives of the Cork Harbour SPA from Dioxins or Furans.

- **PAHs**

PAHs modelling results indicate that the ambient ground level concentrations will be below the relevant air quality target value under maximum and abnormal operation of the facility. Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **Hg**

Hg modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards under maximum and abnormal operation of the facility. Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA, will occur. Emissions at maximum operations equate to ambient mercury concentrations (including background concentrations) which are only 0.2% of the annual average limit value at the worst-case receptor.

- **Cd and Tl**

Modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standard for cadmium under maximum and abnormal operation from the facility. There will be no adverse effects on the conservation objectives of the Cork Harbour SPA from cadmium or thalium.

- **Sum of As, Sb, Pb, Cr, Co, Cu, Ni, Mn and V**

Modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards for arsenic (As) and vanadium (V) (the metals with the most stringent limit values) under maximum and even abnormal operation emissions from the facility (based on the ratio of metals measured at a Waste to Energy facility in Belgium). Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA, will occur under these conditions.

#### 5.6.1.7 AERMOD Modelling Summary

Modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards or guidelines for all parameters under maximum and abnormal operation of the facility. The modelling results indicate that this maximum occurs in the region between the northern and north-eastern boundaries of the facility. Maximum operations are based on the emission concentrations outlined in EU Directive 2010/75/EU.

An appropriate stack height has been selected to ensure that ambient air quality standards will not be approached even under abnormal operating scenarios. The stack height determined by air dispersion modelling which will lead to adequate dispersion was 70 metres.

The spatial impact of the facility is limited with concentrations falling off rapidly away from the maximum peak. For example, the short-term concentrations due to process emissions at the nearest residential receptor will be less than 17% of the short-term ambient air quality limit values. The annual average concentration has an even more dramatic decrease in maximum concentration away from the facility with concentrations from emissions at the proposed facility accounting for less than 1% of the limit value (not including background concentrations) at worst case sensitive receptors near the facility.

#### 5.6.1.8 CALPUFF Modelling Assessment

The CALPUFF modelling system has been recommended by the USEPA as a Guideline Model for source-receptor distances of greater than 50km and for use on a case-by-case basis in complex flow situations within 50km. CALPUFF has some important advantages over steady-state Gaussian models such as AERMOD in areas of complex meteorology.

- **$NO_2$**

$NO_2$ modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards for nitrogen dioxide under maximum and abnormal operation of the facility. Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA, will occur under these conditions at or beyond the facility boundary.

- **$SO_2$, CO, $PM_{10}$ & $PM_{2.5}$**

Modelling results indicate that ambient ground level concentrations will be below the relevant air quality standards for sulphur dioxide, carbon monoxide and $PM_{10}$ under maximum and abnormal operation of the facility. Results will also be below the air quality standard for $PM_{2.5}$ under maximum and abnormal operation of the facility. Thus, no adverse impact on the conservation objectives of the Cork Harbour SPA will occur under these conditions at or beyond the facility boundary.

- **TOC, HCl & HF**

Modelling results indicate that the ambient ground level concentrations will be below the relevant air quality guidelines for TOC (assumed pessimistically to consist solely of benzene), HCl and HF under maximum and abnormal operation of the facility. Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **PCDD / PCDFs (Dioxins/Furans)**

Background levels of Dioxins/Furans occur everywhere and existing levels in the surrounding area have been extensively monitored as part of this study. Monitoring results indicate that the existing levels are similar to rural areas in the UK and Ireland. The contribution from the facility in this context is minor, with levels at the worst-case receptor to the north-west of the facility (approximately 400 metres from the nearest point of the SPA), under maximum and abnormal operation, accounting for less than 6% of the ambient air quality standards under maximum operating conditions.

Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **PAHs**

PAHs modelling results indicate that the ambient ground level concentrations will be below the relevant air quality target value under maximum and abnormal operation of the facility. Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **Hg**

Hg modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards under maximum and abnormal operation of the facility. Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **Cd and Tl**

Modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standard for cadmium under maximum and abnormal operation from the facility. Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **Sum of As, Sb, Pb, Cr, Co, Cu, Ni, Mn and V**

Modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards for for arsenic (As) and vanadium (V) (the metals with the most stringent limit values) under maximum and abnormal operation emissions from the facility (based on the ratio of metals measured at a Waste to Energy facility in Belgium).

Thus, no adverse impact on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

#### 5.6.1.9 Conclusion on modelling results

Based on the emission guidelines outlined in Council Directive 2010/75/EU, detailed air dispersion modelling has shown that the most stringent ambient air quality standards are not exceeded as a result of operating under either maximum or abnormal operating conditions.

The modelling results, using both the USEPA regulatory model AERMOD and the more advanced CALPUFF model, indicate that the maximum ambient GLC occurs at or near the facility's northern and north-eastern boundaries. The spatial impact of the facility is limited with concentrations falling off rapidly away from the maximum peak. The annual average concentration has a dramatic decrease in maximum concentration away from the facility with concentrations from emissions at the proposed facility accounting for less than 2% of the limit value (not including background concentrations) at worst case sensitive receptors near the facility.

In the Cork Harbour SPA, levels are significantly lower than most background sources. The concentrations from emissions at the proposed facility accounting for less than 2% of the annual limit values for all pollutants under maximum operations of the facility.

### 5.6.2 Mitigation by Design

A number of measures have been incorporated into the design of the resource recovery centre to ensure that emissions from the plant do not exceed regulatory emission limit values as outlined in Industrial Emissions Directive 2010/75/EU. Air modelling predictions indicate that ambient air quality due to emissions from the proposed facility will be within the air quality standards at all locations beyond the site boundary, based on maximum and abnormal operating conditions. Thus no specific additional mitigation measures are required during the operational phase of the facility. Based on the results of air dispersion modelling of process emissions, there will be no adverse effects on the conservation objectives of the Cork Harbour SPA during the operational phase of the proposed development.

### 5.6.3 Summary of Sediment and soil Survey

The report Sampling and analysis of soil and sediment samples for PCDDs, PCDFs and PCBs at various locations around Cork Habour (AWN, 2015) is attached as **Appendix 14** of this report.

Soil and sediment sampling was conducted at 12 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. Three of these sites are within the Cork Habour SPA. Samples were analysed for dioxins and furans with results compared to previous data recorded by AWN and EPA sampling in 2000.

The primary aims of the sampling programme carried out by AWN were as follows (where site refers to the proposed Resource Recovery Centre):

- Establish the current concentrations of PCDDs, PCDFs and dioxin-like PCBs in soil and sediments in the vicinity of the site;

- Discuss the relevance of recorded concentrations of PCDDs, PCDFs and dioxin-like PCBs; and

- Compare recorded concentrations in this round with soil and sediment dioxin and furan concentrations obtained for the site by AWN in 2001, 2008, 2009 and historically by the EPA and Cork County Council. As this report is concerned primarily with potential impacts on the Cork Harbour SPA, the sediment sampling programme is relevant. The sediment sampling sites are indicated in the full report **(Appendix14)** and, as far as the Cork Harbour SPA is concerned, were located as follows:

    - Beach 1A, Strand at Whitegate Village (more than 3km east of the proposed development) within the Cork Harbour SPA
    - Beach 2A, Ringaskiddy – Gobby Beach adjacent to road to Haulbowline Island
    - Beach 3A Mud Flats at Buncoille (Monkstown) (circa 2.5km northwest of the proposed development) within the Cork Harbour SPA
    - Beach 4A Mud flats in bay west of Hovione plant at Loughbeg, (circa 900m southwest of the proposed development) within the Cork Harbour SPA.

By sampling in these areas, PCDD/F concentrations in the sediment of these designated areas can be determined and used to whether there will be any adverse impacts on species which may breed, feed, roost or winter in the SPA. In addition, all sediment sampling sites chosen were in areas of muddy sediment which can provide bird feeding habitats and which

are known, or which have an apparent potential, to accumulate contaminants. Details on the sampling methodology and assumptions which were required when assessing results are included in **Appendix 14.**

The results of sediment sampling shows that PCDD/F concentrations in beach sediments were generally higher in the 2015 sampling event than in the 2009 event, with the exception of levels at location Beach 2A which reduced from 0.035 ng/kg to 0.015 ng/kg. The concentration at Beach 1A in Whitegate Village was significantly higher in 2015 with an increase in concentration of more than ten times that of 2009.

There is no Irish statutory threshold values for PCDD/F or dioxin-like PCBs in soils or sediments. However, there are Dutch Target and Intervention values assigned to sum value of the EC7 PCB congeners and in the absence of Irish guidance, these values are typically used. The Dutch Government have set a national target value of 20 µg/kg PCB in soil and a threshold value (the concentration above which remedial action should be considered) of 1000 µg/kg. The highest measured concentration in soil in the Cork Harbour area in the 2015 sampling round was 0.113 ng/kg at Location 3A (Martello Tower) which is well below even the target value, therefore the recorded concentrations can be considered as insignificant.

The UK EA published a document in 2004 entitled "UK Proposed Environmental Quality Guidelines for Dioxins and Furans in Water and Sediments" which applies the concept of using a 2000 ng/kg as a TEQ x fraction of organic carbon to determine an appropriate limit value for dioxin concentration in sediments. When the measured concentrations are compared against the limit value they are all shown to be less than the assigned limits.

The AWN 2015 report concluded 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 UK EA 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."*

### 5.6.4 Ecological Risk Assessment

An ecological risk assessment report was prepared by AWN which specifically considers the risk to piscivorous birds and otter within Cork Harbour. (Ecological Risk Assessment for PCDD/F for Indaver Ringaskiddy Resource Recovery Centre (AWN, 2015). This report is attached as **Appendix 15.**

The risk assessment approach taken was that presented by the US EPA in the documents: Framework for the Application of the Toxic Equivalency Methodology, Polychlorinated Dioxins, Furans and BiPhenyls in Ecological Risk Assessment, US EPA 2003 1 and Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, US EPA, 1999 2.

The approach taken was as follows:

- Model baseline impact of existing background dioxin with respect to predicted concentration in bird egg and concentration in forage fish in otter diet. The bird species focused on were cormorant and common tern.
- Model worst case theoretical increase due to PCDD/F emissions from the waste-to-energy facility,
- Model impact of predicted sediment concentration on selected species
- The receptor location for sediment concentration was in front of Whitegate Village (Beach 1A), which had the highest background levels.
- The baseline calculation for both gull eggs and otters follows the relevant equations from the Framework Application Document above as follows:

  *C (fish eating bird egg) = (Cs/Foc) x BSAF (egg) x fl( egg)*

  *Where*

  *C (fish eating bird egg) is dioxin concentration (pg/g)*

  *Cs is dioxin concentration in sediment (pg/g)*

  *Foc is fraction of organic carbon in sediment*

  *BSAF is the Biota-sediment accumulation factor*

- The increase in dioxin concentration in sediment resulting from airborne dioxin deposition was estimated using a very conservative approach, which was to assume that the maximum dioxin deposition rate from the waste-to-energy facility facility, which is predicted to be close to the boundary of the facility, would, for the purposes of the model, impact on the chosen sample point (beach B1A, which in reality is more than 3 km to the east of the waste-to-energy facility site), so deposition is likely to be many times lower than that modelled. It was also assumed that the sediment in question was permanently exposed to the atmosphere, whereas in reality the sediments will be covered by the tide for much of the day. The modelled increase was determined using deposition data modelled by AWN and the MARI model for soil dioxin.

The ecological risk assessment report concluded the following:

- Baseline dioxin concentrations in the eggs of fish eating birds and in otters considered to be low and well within limit values for the eggs of fish eating birds.
- The predicted change in dioxin concentrations is considered to be insignificant for both fish eating birds' eggs and otters, based on exposure to forage fish.

### 5.6.5 Summary of literature review on possible impacts on the environment from emissions of dioxin and mercury with a particular emphasis on bio-accumulation in piscivorous birds (Appendix 3)

#### 5.6.5.1 History of dioxin and mercury emissions from incineration

- In 1989, for the first time the EU adopted legislation to reduce dioxin emissions from municipal waste incineration by setting up so-called operational conditions, leading to a significant reduction of dioxin emissions. Emission Limit Values (ELV) were set at Community level in the Waste Incineration Directive 2000/76/EC. It is estimated that industrial sources of dioxin and furan emissions in the EU have reduced by almost

80% over the last 20 years. Currently the main sources of dioxin emissions in the EU 25 member states, including Ireland, are from non-industrial activities.

- Since 1995, the Irish EPA have regularly monitored dioxin levels in cow's milk. Levels of dioxins in cow's milk have been consistently low since the surveys began. The levels of dioxins found in the most recent surveys (2012) are well below the EU limit in milk and milk products of 2.5 pg WHO-TEQ/g for dioxins only, and 5.5 pg WHOTEQ/ g for dioxins and PCBs combined. The EPA results are in line with the dioxin results from the latest report from the Cork County Council animal health surveillance programme, which has been operating in the Cork Harbour Region since 1991.The Cork Harbour report found dioxin, furan and PCB levels were significantly less than the applicable limits. This study, which began in 2005, found dioxins and furan levels remained generally stable at values considered as low background levels in European terms.
- In 1995, the US EPA adopted new emissions standards for waste-to-energy facilities pursuant to the Clean Air Act. These so-called MACT (maximum available control technology) regulations dictated that waste-to-energy facilities with large units (i.e., >227 tonnes per day) should comply with new Clean Air Act standards by December 19, 2000. Waste-to-energy facilities now represent less than 1% of the US emissions of dioxins and mercury.

#### 5.6.5.2 Impact of dioxins on wildlife

- In animal studies, tetrachlorodibenzo-p-dioxin TCDD and dioxin-like chemicals demonstrate many effects. Laboratory studies on birds have shown a variety of effects from dioxins including lethality, chick oedema, decreased growth rates decreases in locomotary responses, deficits in body motions and balance, aggressive behaviour and changes in brain neurotransmitters. Fish eating birds which inhabit areas contaminated with TCDD are chronically exposed during embryonic development via the yolk and this has anti-oestrogenic effects. *In ovo* exposure to these compounds during the perinatal period may be responsible for certain behavioural characteristics and reproductive dysfunction.

#### 5.6.5.3 Dioxins in birds and incineration

- A number of studies have attempted to examine the direct links between dioxin contaminated sites and morbidity effects in birds occupying habitats adjacent to them including studies of Anhingas (*Anhinga anhinga*) and White Ibises (*Eudocimus albus*) collected from a colony next to a Florida municipal solid-waste (MSW) combustor and ash landfill and eggs of the Common Tern (*Sterna hirundo*) from the highly polluted colonies, located in the main sedimentation area of the Rhine and Meuse rivers. In the study of Anhingas, most of the measured residues, including TCDD, TCDF, arsenic, beryllium, cadmium and nickel, remained at pre-operational levels during the first five years of facility operation. In the study on Common terns the toxicity of a mixture of dioxins and dioxin-like compounds can be expressed in a single number - the toxic equivalency (TEQ) and this was used as a metric to examine the residual yolk sacs of the hatchlings. Highly polluted colonies, located in the main sedimentation area of the Rhine and Meuse rivers, contained on average 16ng TEQ per gram lipid, which was fivefold higher than the concentrations in the reference colony. These studies were carried out prior to the implementation of the Waste Incineration Directive in the EU and the Clean Air Act in the US, which has led to substantial reductions in incinerator emissions.

#### 5.6.5.4 Impacts of mercury in ecosystems

- Because mercury can be methylated and therefore become bioavailable in aquatic systems, it has historically been considered a problem for species directly associated with aquatic ecosystems, such as piscivorous birds. Studies indicate that there is background uniformity of mercury contamination in the North Atlantic which provides evidence of global pollution by mercury due to atmospheric deposition at long distance from emission sources.
- Birds, such as Heron (*Ardea cinerea*), that consume large fish as their prey, are predicted to be at greater risk of methylmercury poisoning than birds that consume smaller fish. When the quantities of fish consumed on a body weight basis is also considered for smaller birds such as the Kingfisher (*Alcedo atthis*), there is an elevated risk of methylmercury poisoning.
- High concentrations of mercury have been associated with developmental and behavioral abnormalities, impaired reproduction and survival, and in some cases with direct mortality.
- Several estimates exist in the published literature on mercury concentrations in soft tissues (liver, kidney, brain) that are associated with mercury poisoning in bird species. Estimates for extreme hazard and neurological impacts were in the region of 20µg/g fresh weight in soft tissues, brain mercury concentrations of 15 µg/g (fresh weight), or liver or kidney mercury concentrations of 30 µg/g (fresh weight).
- It was observed that significant reproductive impairment due to methylmercury occurred at about one-fifth the tissue concentrations required to produce overt neurotoxicity. Such effects include decreased hatchability of eggs. Dietary methylmercury also reduces the appetite and growth rates of baby birds.

#### 5.6.5.5 Waste incineration and mercury in birds

- This subject was intensively studied in the Everglades in south Florida. The Everglades system was historically highly contaminated with mercury which had been linked to local waste incineration. Some results supported the hypothesis that nestlings are protected from the harmful effects of mercury through deposition of mercury in growing feathers. The implementation of the Clean Air Act in 2000 led the significant decreases in local mercury inputs. Studies concluded that the Everglades has undergone a biologically significant decline in mercury availability in the wetland food web, possibly because of decreased local inputs.

#### 5.6.5.6 Conclusions of literature review on possible impacts on the environment from emissions of dioxin and mercury with a particular emphasis on bio-accumulation in piscivorous birds (Appendix 3)

- Historically dioxin and mercury emissions from incinerators have been the cause of much public concern. However, the implementation of the EU Waste Incineration Directive 2000/76/EC and the Clean Air Act in the US has led to large reductions in incinerator emissions across the developed world. In Germany, for example, incinerator dioxin emissions have fallen from 400 grams to less than 0.5 grams a year, since the year 2000. Incinerators now represent less than 1% of total dioxin emissions in Germany. In Ireland dioxin levels are currently significantly less than applicable limits and are considered as low background levels in European terms.
- Laboratory studies on birds and mammals have found an array of negative effects from dioxins and heavy metals. While a number of studies have attempted to replicate these effects in the wild, in areas which are heavy polluted, the results have been inconclusive. In one study, uptake of dioxins in the bird population resident near a waste incinerator were not increased in the ten years following the facility's opening. One complication of feeding animals diets containing fish collected from contaminated waters, appears to be that other unaccounted for contaminants can

influence the overall toxicity of the mixture. While gaps in the research exist, between lab and field based studies, it does appear that the impact of polluted sediments on animals is complex. The complexities of examining individual and combination effects of dioxins, PCBs and heavy metals in the field seem, at present, to be beyond the reach of researchers. However, it does appear that the contribution of waste incineration to these pollutants has decreased significantly. In the years since strict legislation governing waste incineration has been implemented, mercury concentrations in bird feathers has dropped significantly alongside declines in mercury inputs from industrial sources.

### 5.6.6 Additional information requested by the NPWS during consultation in relation to possible emission impacts (See section 3.3)

During consultation with the NPWS, information was sought in relation to particular issues that relate to the possible impacts of emissions from the proposed facility on Natura 2000 sites. These are addressed in **Appendix 2** and the responses are summarised below. The NPWS information requirements are as follows:

- Comparative data from similar waste-to-energy incinerator facilities (Point 3 of DAU letter).
- Information on plant start-up and shut-down procedures including frequency of start-up and shut-down, and emergency response procedures (Requested at the NPWS meeting, May 2015).
- Review of potential bio-monitoring programmes (Requested at the NPWS meeting, May 2015).
- Information on air emission monitoring data from Indaver's plant at Carranstown, Co Meath. (Requested at the NPWS meeting, May 2015).
- Effects of hazardous compounds (Point 8 of DAU letter).

### 5.6.7 Conclusions - Impacts on piscivorous birds from air emissions and possible bioaccumulation

In determining the potential impact from emissions and bioaccumulation, the following points were taken into consideration:

- In line with the Industrial Emissions Directive, Directive 2010/75/EC, best available techniques (BAT) are required to be used in pollution prevention and control. BAT have been incorporated into all aspects of the design of this project.
- The facility will be operated under an industrial emission licence. Indaver must implement an environmental management system to manage and control all aspects of the operation.
- Within the incineration process, a hazardous substance that is fed into the furnace does not come out unchanged as the same hazardous substance, either in the residues or in the exhaust gases. In the furnace the hazardous substance is oxidised which means it under goes a chemical reaction and is converted into one or more different substances with different properties. These different substances are removed in the ash or flue gas cleaning residues and a very small quantity is discharged to the air in the exhaust gases. Compounds such as dioxins which form

after combustion is complete (and at lower temperature windows in the boiler of around 450°C) are removed by the injection of activated carbon/clay.

- Potential impacts on air quality have been comprehensively addressed. This appraisal reviewed background information on ambient air quality, potential cumulative impacts, identified significant substances which could arise from the facility, identified suitable models and used the two most appropriate models to predict the concentrations at ground level by reference to stringent air quality standards. Modelling was based on conservative assumptions which overestimate the impact of the facility. Notwithstanding these conservative assumptions it was concluded that '*Air modelling predictions indicate that ambient air quality levels from the proposed facility will be within the ambient air quality standards at all locations beyond the site boundary, based on maximum and abnormal operating conditions.*'
- Soil and sediment sampling was conducted at 12 locations in the Cork Harbour Area with the aim of determining background concentrations of PCDD, PCDF and dioxin-like PCBs in the vicinity. Samples were obtained from areas of muddy sediments where birds will feed and 3. Sediment sampling locations were located within the Cork Harbour Special Protection Area (SPA). Background concentrations were found to be below the Dutch limit value concentrations and UK Environment Agency limit values.
- A literature review concluded that dioxins and mercury can impact on birds and mammals. However, the implementation of the EU Waste Incineration Directive 2000/76/EC and the Clean Air Act in the US has led to large reductions in incinerator emissions across the developed world. In the years since strict legislation governing waste incineration has been implemented, mercury concentrations in bird feathers has dropped significantly alongside declines in mercury inputs from industrial sources.
- Since 1995, the Irish EPA have regularly monitored dioxin levels in cow's milk. Levels of dioxins in cow's milk have been consistently low since the surveys began. The levels of dioxins found in the most recent surveys (2012) are well below the EU limit in milk and milk products of 2.5 pg WHO-TEQ/g for dioxins only, and 5.5 pg WHOTEQ/ g for dioxins and PCBs combined (Concannon, 2014). The 2013 report from Cork County Council animal health surveillance programme, which addresses the years 2005 – 2010, found dioxin, furan and PCB levels were significantly less than the applicable limits.
- An Ecological Risk Assessment concluded that the baseline dioxin concentrations in the eggs of fish eating birds and in otters considered to be low and well within limit values for the eggs of fish eating birds. The predicted change in dioxin concentrations is considered to be insignificant for both fish-eating, bird's eggs and otters, based on exposure to forage fish.
- A review of the start-up and shut down processes and procedures has concluded that the risk of poor performance with respect to dioxins during start-up and shut down of the furnace will be effectively prevented.
- The waste-to-energy plant at the Ringaskiddy Resource Recovery Centre will be very similar to the Indaver Carranstown, Co Meath, plant. Air emission monitoring data from the Carranstown facility show that the concentration of dioxins in emissions from the plant, in the years 2012, 2013 and 2014, were substantially less than one tenth of the licensed emission limit value. For the year 2014, the daily average emissions of dust, metals, acid gases, carbon monoxide, sulphur dioxide and nitrous oxides from the facility complied with the licensed emission limit values.

- In Belgium, France and the UK examples of incinerators can be found located within less than 0.5km of an SPA and the results suggest that proximity to an SPA does not, in general, create a significant barrier to permission being granted to incinerators in proximity to SPAs.
- The closest part of the Cork Harbour SPA is located 0.5km from the site boundary and the area of shoreline which adjoins the site boundary is not of high value for birds listed as special conservation interests for this SPA.
- Based on the above, and taking possible cumulative impacts into consideration, there will be no adverse effects on the conservation objectives of the Cork Harbour SPA arising from any emission from the proposed waste-to-energy facility. Similarly, given the low background levels and the low concentrations of toxic substances in emissions, the risk that significant bioaccumulation will occur is considered negligible. Therefore, there will be no adverse effect on the integrity, special conservation interests and conservation objectives for the Cork Harbour SPA from emissions, including cumulative emissions and possible bioaccumulation.

## 5.7 Implementation of Mitigation measures

### 5.7.1 Implementation of mitigation measures - evidence of how these will be secured and implemented and by whom and evidence of how measures will be monitored and should mitigation failure be identified how that failure will be rectified.

Indaver will appoint a construction management team for the duration of the construction phase. The construction management team will be based on site. The team will supervise the construction of the project, including monitoring the performance of the contractors to ensure that the proposed construction phase mitigation measures are implemented and that construction impacts and nuisance are minimised.

The team will monitor the implementation of the construction mitigation measures. If a mitigation measure is not implemented or if it fails the construction management team will require the relevant contractor to immediately rectify the situation.

### 5.7.2 Implementation of mitigation measures - evidence of degree of confidence in their likely success.

The proposed mitigation measures are tried and tested on many construction projects and their efficacy is proven. The likely success of the proposed mitigation measures is high, either in their current form or as they will be adapted on-site to achieve the desired result. The measures incorporated into the project design and mitigation measures have been drawn up in line with current best practice and include an avoidance of sensitive habitats at the design stage. It is clear in what the mitigation measures are designed to achieve in lowering or reducing the risk of impact to acceptable levels. Whilst the proposed methods of mitigation may be amended and supplemented the risk that the mitigation measures will not function effectively in preventing adverse impacts on designated sites is low.

### 5.7.3 Implementation of mitigation measures - timescale, relative to plan or project for their implementation or completion.

The timescale for implementation of the mitigation measures will be dependent on the construction programme of the proposed project. However, based on evidence from other projects, the mitigation measures can only commence in tandem with other site operations as staff, machinery and other resources are necessary to implement the measures. Certain mitigation measures will have to be undertaken in advance of certain construction works, while others can proceed in parallel and others will only be necessary following completion of the main site works.

## 5.8 Biomonitoring

The NPWS requested that the potential benefits and practicality of a bio-monitoring programme for mercury and dioxin levels within birds in Cork Harbour during operation of the facility be assessed. Specifically the use of bird feathers and eggs of piscivorous birds was considered as a potential mechanism for assessing possible bioaccumulation. A review including a literature review was carried out to assess the viability of such a bio-monitoring programme (**Appendix 6).**

### 5.8.1 Conclusion of bio-monitoring review

A notable method for examining the impact of pollutants in the wild is bio-monitoring. While studies on heavy metals, in particular mercury, are well established, non-invasive bio-monitoring for dioxins is still relatively new. Bird feathers and eggs have been successfully used to monitor mercury levels in birds for many years. In the case of dioxins, bird livers and muscle are commonly used, although a number of studies have successfully used eggs to monitor contamination levels. However, other factors, including age, sex, time of year, migratory status and, in the case of eggs, laying sequence, will affect the levels of mercury or dioxins detected. Therefore using such techniques to monitor mercury patterns in a single area, or from a single source (in this case the proposed Indaver facility) appears very difficult if not impossible.

Indaver contacted representatives of the waste-to-energy industry in the UK, Ireland, Germany, Belgium and The Netherlands but found no evidence for a biomonitoring programme instigated by a specific incinerator. The general consensus was that such programmes are not required due to the low emission levels and the low potential for impacts.

The predicted levels of dioxins and mercury generated by the facility will be low and no significant impact on piscivorous bird species is predicted. Given the difficulties inherent in determining the source of dioxins and mercury in piscivorous birds and the difficulties in ascribing levels to any particular source, the use of cows' milk is considered an adequate means of determining if problematic levels of dioxins are entering the food chain via atmospheric deposition. The EPA conducts such monitoring of dioxin in cows milk in Ireland, including in the Ringaskiddy area.

## 5.9 Conclusions of the Natura Impact Statement

The Stage One Screening appraisal contained in this report considered the potential for significant impacts arising from the proposed development on Natura 2000 sites within a 20km radius. Following screening, the only Natura 2000 site for which potential significant impacts have been identified is the Cork Harbour SPA, which is located approximately 0.5km from the proposed development site at its closest point.

Impacts which were considered to have the potential to impact on the Cork Harbour SPA related to disturbance during construction and operation, a possible fire in the bunker during operation, impacts on the marine environment during construction and operation, the collision risk to birds created by the stack during operation and the potential for emissions of substances with eco-toxicological effects and possible bioaccumulation through the food chain. Potential cumulative impacts were also considered.

A range of precautionary measures have been incorporated into the project design, and other mitigation measures have been developed and proposed, with the purpose of avoiding or minimising impacts on the qualifying interests and conservation objectives of the Cork Harbour SPA, which is located 0.5km from the Indaver site. The likely success of these

measures was also considered and no particular difficulties in their effective implementation were identified.

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC (2000) defines 'integrity' as the 'coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and / or population of species for which the site is or will be classified'. *The draft documents Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Draft)* (EC, 2015) states that the integrity of the site can be usefully defined as the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated"

Following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the qualifying interests and conservation objectives for the Cork Harbour SPA, it has been concluded that the proposed development will not have an adverse effect on the integrity of the Cork Harbour SPA.