INDAVER

Ringaskiddy
Resource Recovery Centre

VOL 1

IE Licence Application | 2019
Non-Technical Summary



Delivering Sustainable Waste Treatment Solutions For a Growing Population

Attachment 1.2 Non-Technical Summary

1.0 INTRODUCTION

This non-technical summary includes a brief overview of the IE licence application, detailing each of the sections contained within the application that are relevant and applicable to the Ringaskiddy site. It should be noted that in order to obtain comprehensive detailed description of the installation and the activities that will be carried out there, the full application should be viewed.

Indaver Ireland Limited (Indaver) is applying to the Environmental Protection Agency (the Agency) for an Industrial Emissions (IE) Licence for a new waste-to-energy facility in Ringaskiddy, Co. Cork.

The waste-to-energy facility will treat up to up to 240,000 tonnes per annum of residual household, commercial, industrial, non-hazardous and suitable hazardous waste which is currently landfilled or exported. Up to 24,000 tonnes per annum of suitable hazardous waste will be treated at the facility. The facility 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 (MW_e)) resources from residual waste.

The heat produced by the combustion process will be recovered and will generate approximately 21MW_e of which up to 18.5MW_e will be exported to the National Grid. The electricity produced by the waste-to-energy facility will be enough to supply the power needs of approximately 30,000 households. The remaining 2.5MW_e will be used to run the facility itself.

An Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) have been prepared and completed in 2019 to support this licence application. This Non-Technical Summary summarises both the contents of the EIAR and the IE licence application documents. Interested readers, if they require more information on any aspect of the development, should refer to the Ringaskiddy Resource Recovery Centre website http://www.ringaskiddyrrc.ie/ where all of the documents supporting the application will be made available.

2.0 GENERAL INFORMATION

2.1 Planning Permission

Planning permission was granted by An Bord Pleanála in May 2018 as part of a Strategic Infrastructure Development application (Case Reference: 04.PA0045) for the Waste to Energy Facility at Ringaskiddy, Co Cork. The planning application documents, including the Environmental Impact Statement (EIS) and the Natura Impact Statement (NIS) from 2016 are included with this application.

2.2 Site Notice and Notifications of Application Intent

A site notice advising of the licence application has been erected at 2 no. locations on the perimeter of the Ringaskiddy site facing the public road. The notices will remain in place for at least one month after the date of submission of the application to the Agency.

Notification of the IE Licence application was also placed in the Irish Independent and the Irish Examiner on 5th July 2019, and a letter was sent to the planning authority, Cork County Council, notifying them of the application on July 16th 2019.

2.3 Activities to be Licensed

The classes and nature of the Industrial Emissions Directive activities applicable to this facility in accordance with the First Schedule to the Environmental Protection Agency Act 1992 as amended are as follows:

Class 11.3 Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants –

(a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour,
(b) for hazardous waste with a capacity exceeding 10 tonnes per day.

2.4 Seveso III Regulations

Based on the information available for products used on site and corresponding usage and storage volumes, the EC (Control of Major Accidents Hazards involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015) do not apply to this site.

2.5 Medium Combustion Plant Regulations

Medium Combustion Plant Directive (MCPD) EU 2015/2193 will not be applicable to this facility. There will be 1 no. diesel fired generator and 3 no. diesel fired firewater pumps, however, these will have a thermal capacity of less than 1MWth as such the MCPD will not apply.

3.0 DESCRIPTION OF SITE AND ACTIVITIES

3.1 Description of the Installation

The main infrastructure elements of the waste-to-energy facility include:

- Security building/gate house and weighbridges
- Main process building, with a stack extending to 75mOD
- Aqueous waste storage tank and tanker unloading area
- Turbine hall and aero-condenser structure
- Electricity substation, compound and grid connection.

Other ancillary elements include:

- Light fuel oil storage tank, aqueous ammonia storage tank and unloading area
- Laboratory
- Administration building
- Firewater storage tank and pump house
- Surface water attenuation tank and firewater retention tank.

Refer to Figure 1 below for the overall layout plans of the proposed development.



Figure 1. Overall Site Layout

3.2 Hours of Operation

Proposed hours of operation will be 24h a day, seven days a week for an average of approximately 8,000h per year.

Waste acceptance will be limited to the hours 06:00 to 20:00 on weekdays and 09:00 to 14:00 on Saturdays. During weekdays, deliveries will be restricted between the hours of 07:00 and 09:00 in the morning and 16:00 to 18:00 in the evening. There will be no waste accepted on Sundays.

The restriction of deliveries during these times will be detailed in the HGV Mobility Management Plan required under condition 8 of the existing planning permission 04.PA0045.

3.3 Structure and Personnel

Indaver will manage the Ringaskiddy Waste Management Facility through its existing senior management structure with both existing and dedicated staff. Indaver will also recruit for the specific roles required for the operation of the plant (similar to their Meath facility).

Specific responsibility to co-ordinate the environmental management programme will be assigned to the Compliance Manager in conjunction with the Plant Manager.

All managers, including team leaders, will also be actively involved in the implementation of the environmental management programme. Every manager and staff member in the organisation will be expected and required to accept responsibility for the protection of the environment and ensuring the safety of the area within his/her care.

3.3.1 Employee Training

Indaver Ireland staff will be prepared for every stage of construction, commissioning and operation of the facility.

Key operations staff will be recruited prior to the commissioning of the Meath Waste Management Facility. They will undergo extensive training by experienced personnel at the Meath waste-to-energy plant or at a comparable waste-to-energy plant operated by Indaver in Belgium.

In addition, all plant personnel will undergo training in co-operation with the waste-to-energy plant manufacturer and equipment designers and suppliers. The contractors will also be involved in the commissioning and testing of the plant and will contribute to the smooth start up and running of the plant. As part of the contractual agreement, representatives from the contractor will be required to remain on-site until the facility has been fully commissioned and are required to be on call for 24 months after commissioning. This will enable the operators to become familiar with the equipment and train directly with the equipment's design engineers.

3.4 Unit Operations

The waste-to-energy process can be divided into five main unit operations or process elements as follows:

- waste acceptance
- waste handling, storage and feeding
- combustion process
- energy recovery process
- flue gas cleaning.

An overview of the complete process is provided in Figure 2 below.

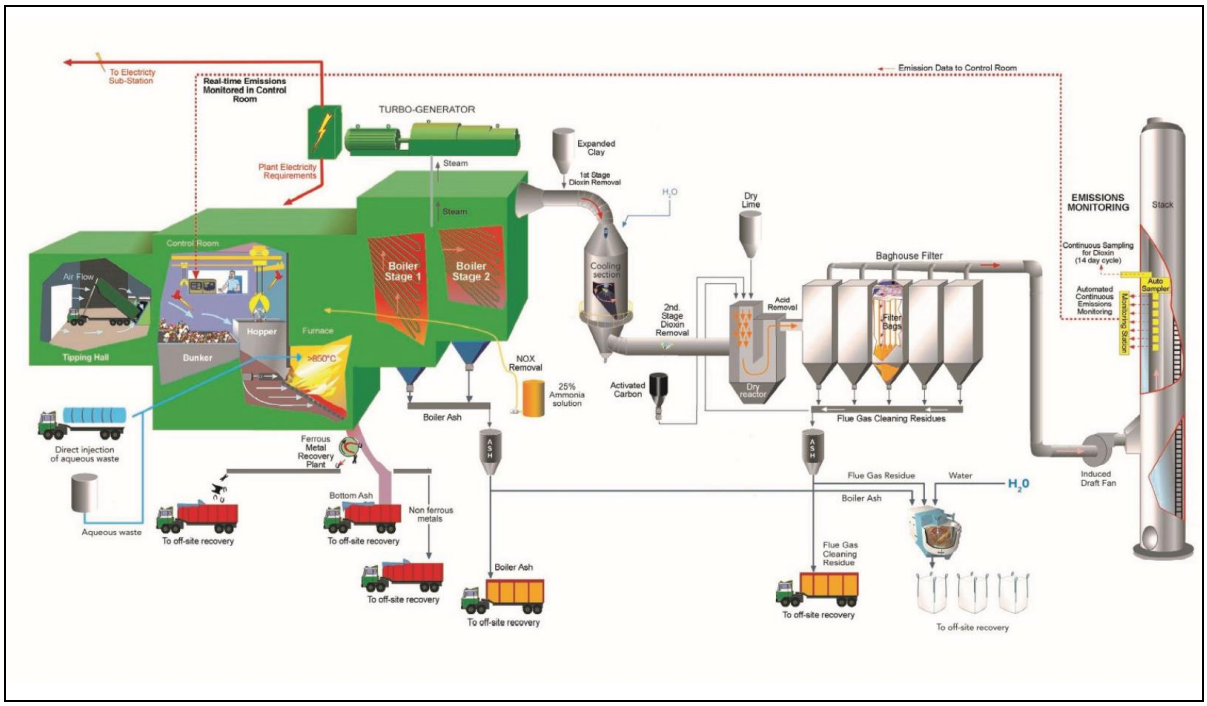


Figure 2. Process Overview

3.4.1 Waste Acceptance

Both solid and aqueous wastes will be accepted at the facility.

Upon arrival at the facility, every delivery is controlled and an electronic ID badge issues to each driver to record the vehicle registration number, weight, type of waste by LoW code, time of entry and exit etc. No waste delivery can cross the weighbridge without a badge being issued.

A radiation monitoring system will be installed on the incoming weighbridge and all waste deliveries to the site will pass through this device.

Two weighbridges will record the entry and exit weight of each delivery and automatically record this on Indaver's ERP software SAP. A traffic light system on the incoming and outgoing weighbridge controls the movement of the accepted waste deliveries. Each delivery is planned in advance by the Indaver planning team and if the delivery is not registered on the SAP system, then it cannot be accepted.

The process flow diagrams from the waste acceptance procedure are shown below in Figures 3 and 4 below.

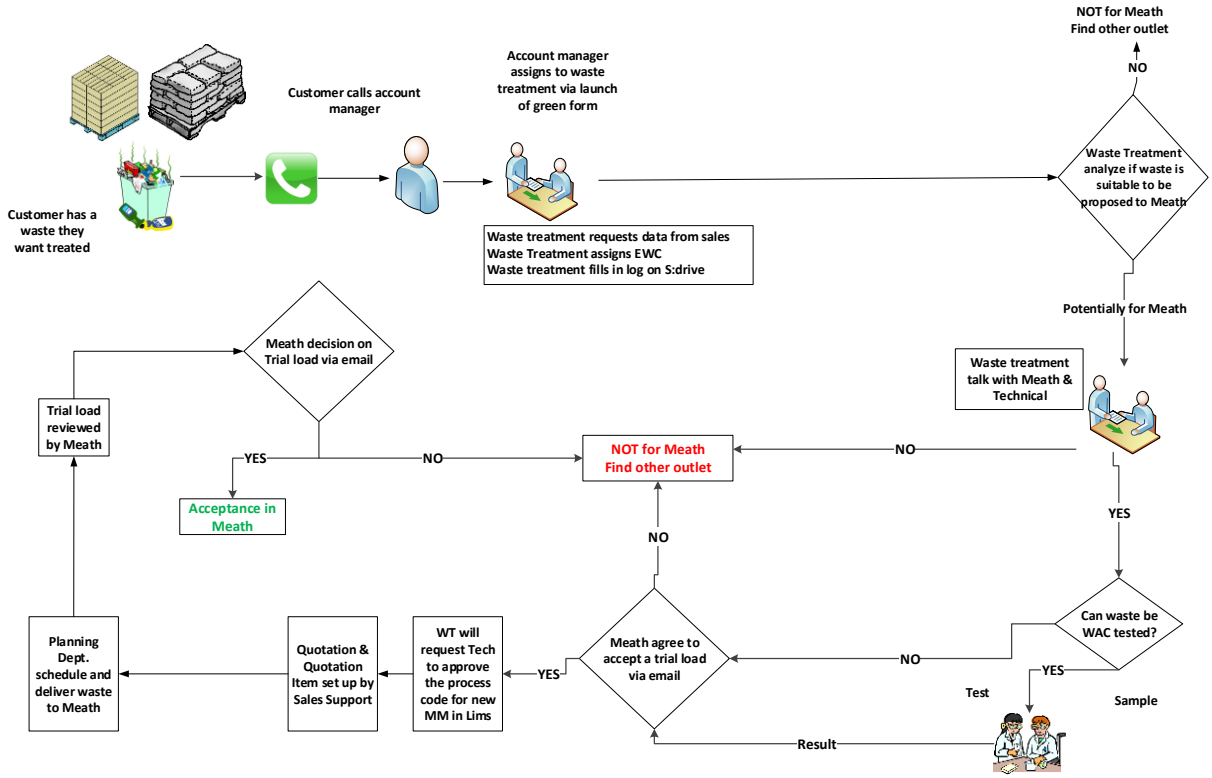


Figure 3 Non-hazardous waste acceptance process flow diagram

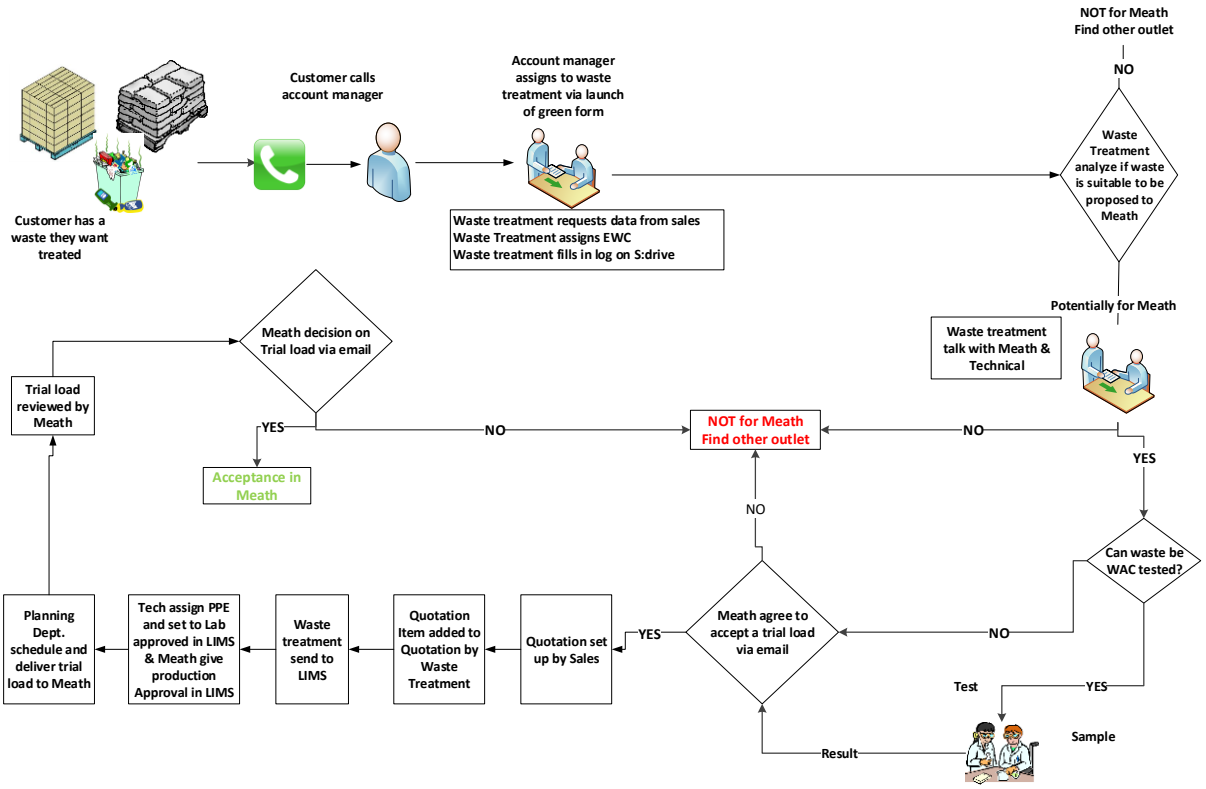


Figure 4 Hazardous waste acceptance process flow diagram

3.4.2 Waste handling, storage and feeding (solid waste)

All solid waste (including sludges) will be discharged to the concrete bunker via the enclosed tipping hall. The waste bunker and tipping hall are kept under negative air pressure to avoid the egress of odour and the extracted air is used as primary air for combustion in the furnace.

Solid waste is then mixed by one of two grab cranes and fed to the hopper which feeds the furnace via the connecting waste chute.

A solid waste inspection area will be provided within the tipping hall where certain solid waste deliveries can be tipped and inspected for conformity.

A front loader with a bucket will then transfer the waste to the bunker via the tipping gates. If the waste load is rejected for treatment, then it will be re-loaded and quarantined in the quarantine area outside the tipping hall until a suitable outlet for the waste is sourced or sent directly back to the customer.

A process flow diagram of the waste handling, storage and feeding system is outlined in Figure 5 below.

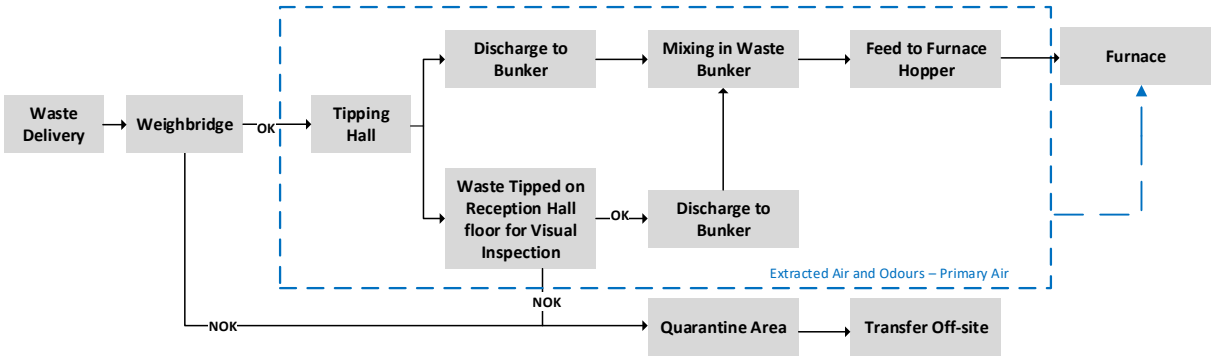


Figure 5. Waste handling, storage and feeding system

3.4.3 Waste handling, storage and feeding (liquid waste)

All liquid wastes will be sampled and analysed prior to unloading to the 250m^3 storage tank or direct injection to the furnace. The tank will be kept under a nitrogen blanket for safety and any overpressure from the aqueous waste unloading operation will be piped under forced ventilation to a secondary air injection point in the furnace.

The unloading area will be a contained area to guarantee that in the event of a spill, there is no ingress to the surface water collection network on the site.

Once unloaded to the storage tank, the aqueous waste within the tank is then mixed via re-circulation and pumped to a lance or series of lances in the roof of the furnace directly above the grate.

Empty tankers leaving the site will be washed using either a simple water hose or by the insertion of a cleaning head through the top manlid of the tanker. This equipment will be installed in the service yard directly north of the storage tank. Contaminated washings from this operation will be transferred to the aqueous waste storage tank.

A process flow diagram of the waste handling, storage and feeding system is outlined in Figure 6 below.

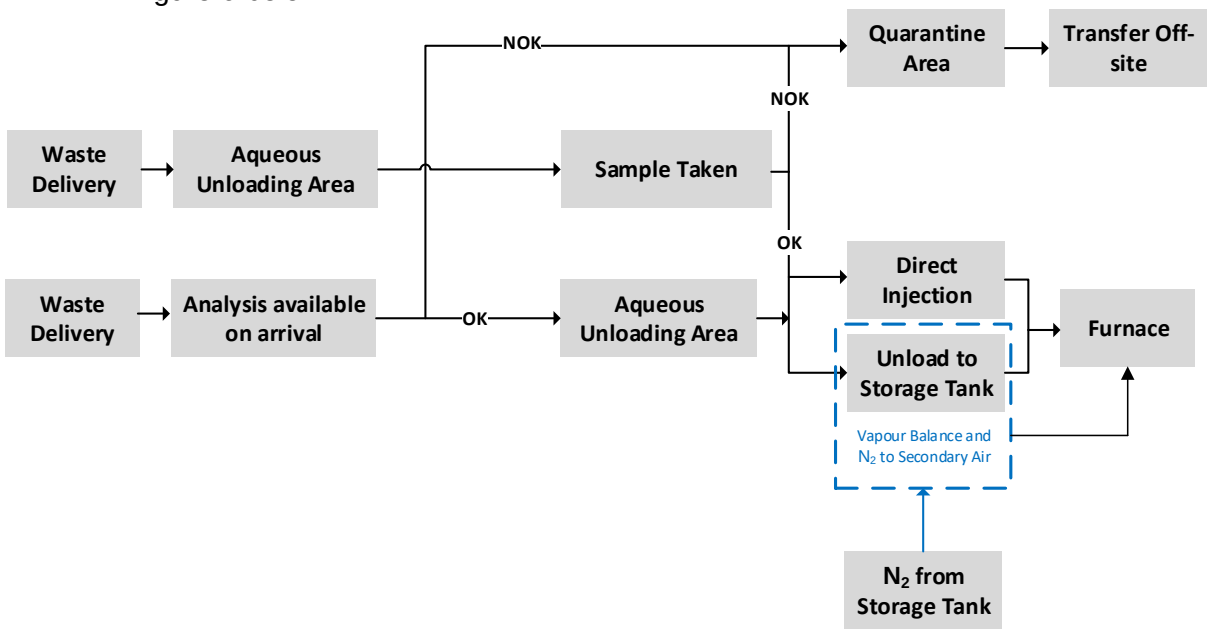


Figure 6. Waste handling, storage and feeding system for aqueous waste

3.4.4 Combustion Process

The combustion process utilises a conventional grate furnace to burn solid and aqueous waste at temperatures in excess of 850°C and to convert them to bottom ash and hot flue gases using primary air extracted from the tipping hall and bunker area and secondary air extracted from the roof area of the main process building. The energy in the hot flue gases is then extracted in a conventional steam boiler where the steam is sent to a steam turbine for the generation of electricity. The cooled flue gases are then cooled further and cleaned in the flue gas treatment section of the plant.

A process flow diagram for the operation of the furnace is provided below in Figure 7. The inputs to the furnace are waste, heat (from fuel oil at startup), primary air and secondary air.

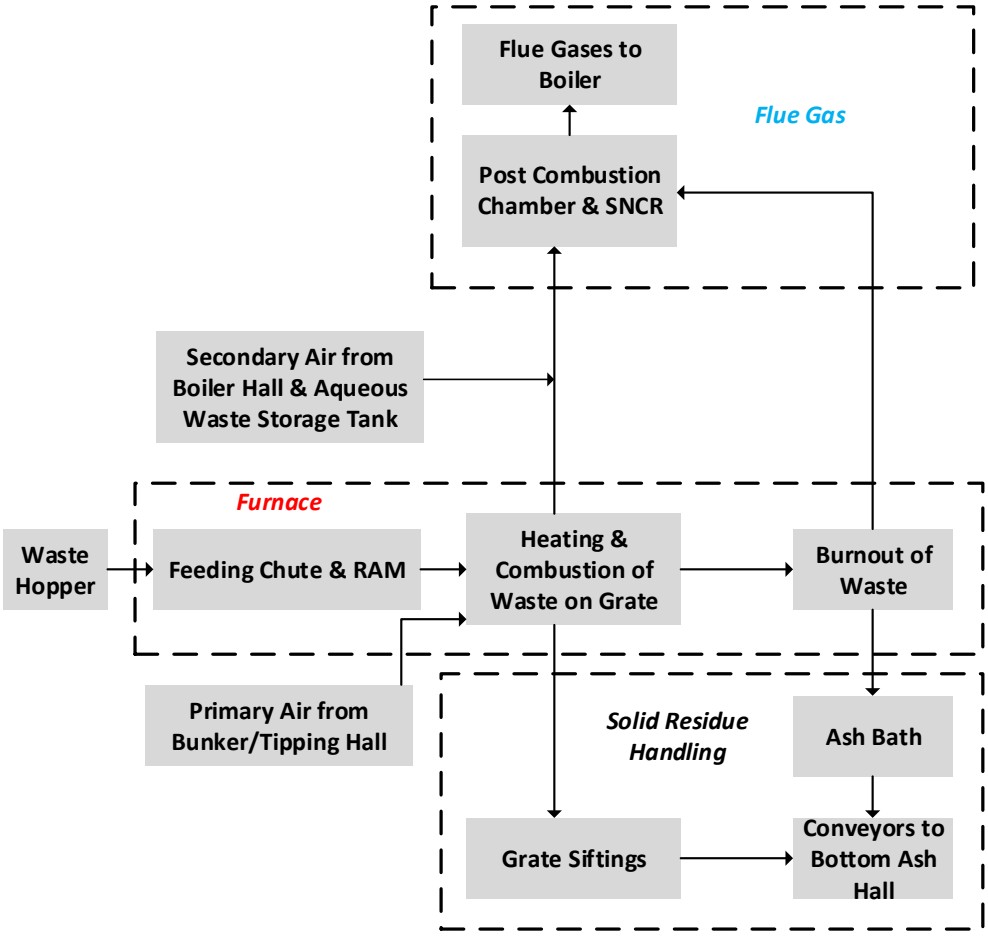


Figure 7. Process flow diagram for the operation of the furnace

Auxiliary burners using fuel oil are utilised to maintain the temperature in the furnace if required. Under normal operation, the use of the burners is not required. Oxides of nitrogen will be controlled through combustion and through the injection of ammonia solution or urea. This process is referred to as SNCR or selective non-catalytic reduction of nitrogen oxides in the flue gases.

3.4.5 *Energy Recovery Process*

As outlined above, energy is recovered from the hot flue gases exiting the furnace in a conventional steam boiler. High pressure steam at 420°C is produced and sent to the steam turbine and generator set which produces electricity from the steam. The flue gases exiting the boiler will be cooled to 160°C before entering the flue gas treatment section of the plant.

Of the 80MW of heat put into the plant from the waste, almost 85% (66.7 MW) of this is converted directly into steam which in turn generates approximately 21MW of electricity (MW_e). The plant itself will have an electrical demand of approximately 2.5 MW_e, leaving 18.5 MW_e available for export to the national grid.

An integrated process flow diagram (steam side plus flue gas side) is shown below in Figure 8.

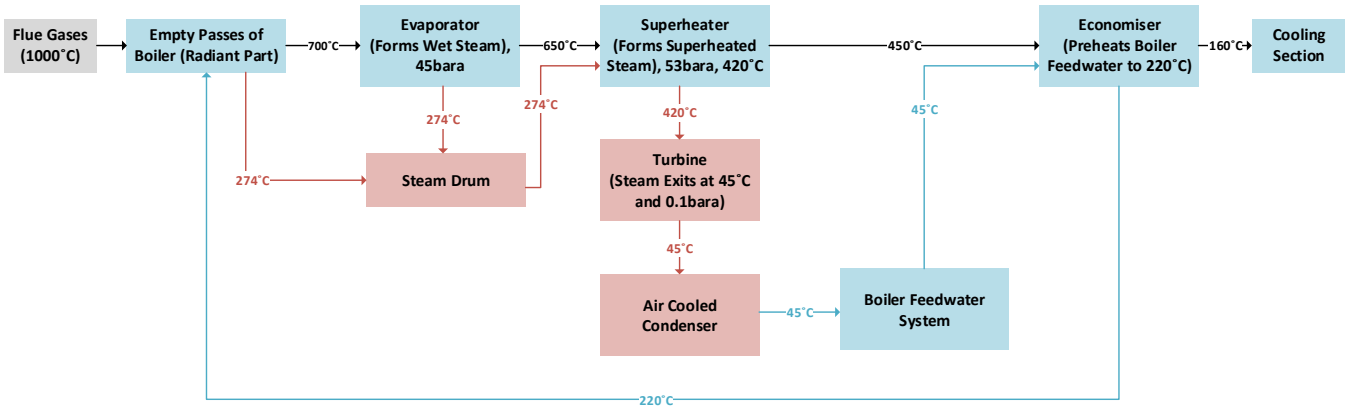


Figure 8. Flue gas boiler and steam turbine process

3.4.6 *Flue Gas Cleaning Process*

The flue gas cleaning equipment will reduce dioxin concentrations in the flue gas to levels well below the limits 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 gases exiting the boiler will be first cooled by the injection of water. 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 large surface area. Dioxins, furans, other trace organic compounds and heavy metals in the flue gases will be adsorbed onto the activated carbon particles. Lime will also be injected into the flue gases in the dry reactor for the removal of acid gases. 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 it.

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. Refer to Figure 9 below for an overview of the flue gas cleaning process.

The inputs from this stage of the process will be the activated carbon/clay/lime. The outputs will be flue gases and flue gas cleaning residues.

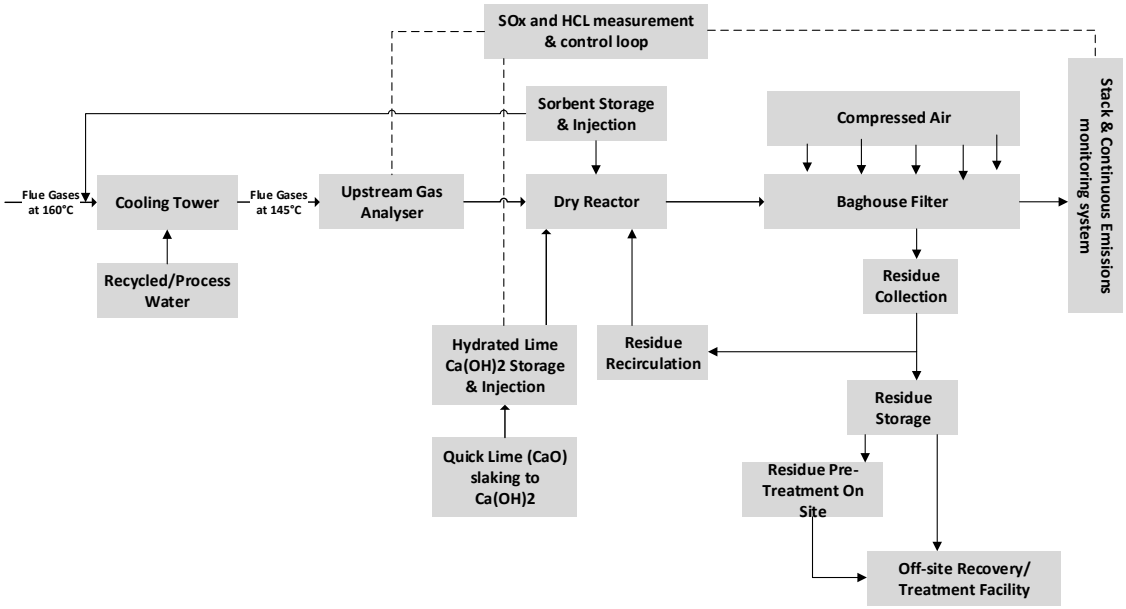


Figure 9. Flue gas cleaning process

4.0 NATURE OF THE WASTE ACTIVITY

4.1 Classification of the Waste Activity

As the facility is designed and will be operated primarily to treat municipal solid waste (MSW) which is non-hazardous then the activity concerned is a Recovery Operation. The relevant recovery activity in this case is "*R01 - Use principally as a fuel or other means to generate energy*". The facility will be designed to ensure that the criteria for achieving R1 status will be achieved.

Indaver's waste-to-energy facility in Meath has retained this status as a recovery facility since its first full year of operation and the same philosophy for the recovery of energy will be adopted in the design for this facility to that R1 status is achieved.

4.2 Storage of Waste and Other Materials

4.2.1 Waste Inputs

The waste inputs to the facility are primarily non-hazardous residual municipal, commercial and industrial solid wastes. The total plant capacity is 240,000 tonnes per annum and 24,000 tonnes of this is for suitable, solid and liquid hazardous wastes. Residues from the mechanical-biological treatment of waste, if these become available, will also be treated.

4.2.2 Raw Material Inputs

The following feedstocks will also be used:

- Lime used as $Ca(OH)_2$ for the removal of acid gases in the flue gas cleaning process;
- Ammonia as 24.9% Ammonium Hydroxide Solution for the reduction of Nitrogen Oxides;

- Activated Carbon or Activated Carbon/Clay mixture for dioxin and heavy metal removal;
- Hydrochloric Acid as 30% solution in water;
- Sodium Hydroxide as 50% solution in water;
- Sodium Phosphate for boiler feedwater treatment;
- Fuel Oil for burners for temperature control and start-up/shut-down; and
- LPG Cylinders (Propane) for burner pilot flame.

4.2.3 Waste Outputs

There are three solid residues produced by the process:

- Bottom ash – 52,000 tpa
- Boiler ash – 2,000 tpa
- Flue gas cleaning residues – 9,100 tpa.

The waste hierarchy has been adopted when sourcing and deciding on the options for the treatment of these solid residues produced by the process.

Circa 52,700 tonnes per annum of bottom ash will be produced in the facility. The bottom ash will be recovered or disposed to landfill, sent to another EU member state for treatment and subsequent recovery, or if appropriate facilities are developed, will be recycled following treatment in Ireland.

Circa 2,000 tonnes per annum of boiler ash and circa 9,100 tonnes per annum of flue gas cleaning residues will be produced in the facility. The boiler ash and flue gas cleaning residues will be in the form of fine particles and will contain heavy metals. The boiler ash and flue gas cleaning residues will be suitable, after solidification, for use to backfill the void space in an underground salt mine, which can receive a recovery code, or in a hazardous waste landfill.

There is one saltmine in Northern Ireland accepting boiler ash and flue gas cleaning residues for recovery and backfilling of the mine. The boiler ash and flue gas cleaning residues from Indaver's Meath facility are currently shipped to both this saltmine in Northern Ireland and to underground salt mines in Germany. It is proposed that, depending on the availability of outlets, the boiler ash and flue gas cleaning residues from the proposed Ringaskiddy facility will also be shipped to both facilities.

An annual average of 2,400 tonnes of ferrous metals, such as steel and 240 tonnes of non-ferrous metals will be recovered from the bottom ash for recycling.

There will be no aqueous or trade effluent discharges from the facility.

4.3 Waste Quantities Accepted

Planning permission has been granted for an annual maximum waste acceptance limit of 240,000 tpa. Planning permission has also specified that no more than 24,000 tpa of hazardous waste shall be accepted at the facility in any one year. The maximum tonnage of both hazardous and non-hazardous waste is therefore 24,000 tpa and 240,000 tpa respectively.

4.4 Waste Storage Quantities

Up to 8,000 tonnes of solid waste can be stored in the concrete waste bunker and 250 tonnes of aqueous waste in the storage tank provided on site.

4.5 Waste Acceptance Procedure

Control of this process is governed by Indaver's waste acceptance procedure and waste handling procedure for both solid and liquid non-hazardous and hazardous wastes. The key tenet of the procedures is to ensure that before arrival on site, the waste has been deemed suitable for treatment and that when the waste actually arrives on site, that it is presented in a way that facilitates the successful treatment of that waste with the minimum amount of effort or manipulation. An example of the process followed prior to the acceptance of a suitable hazardous waste on site is provided in Figure 10 below.

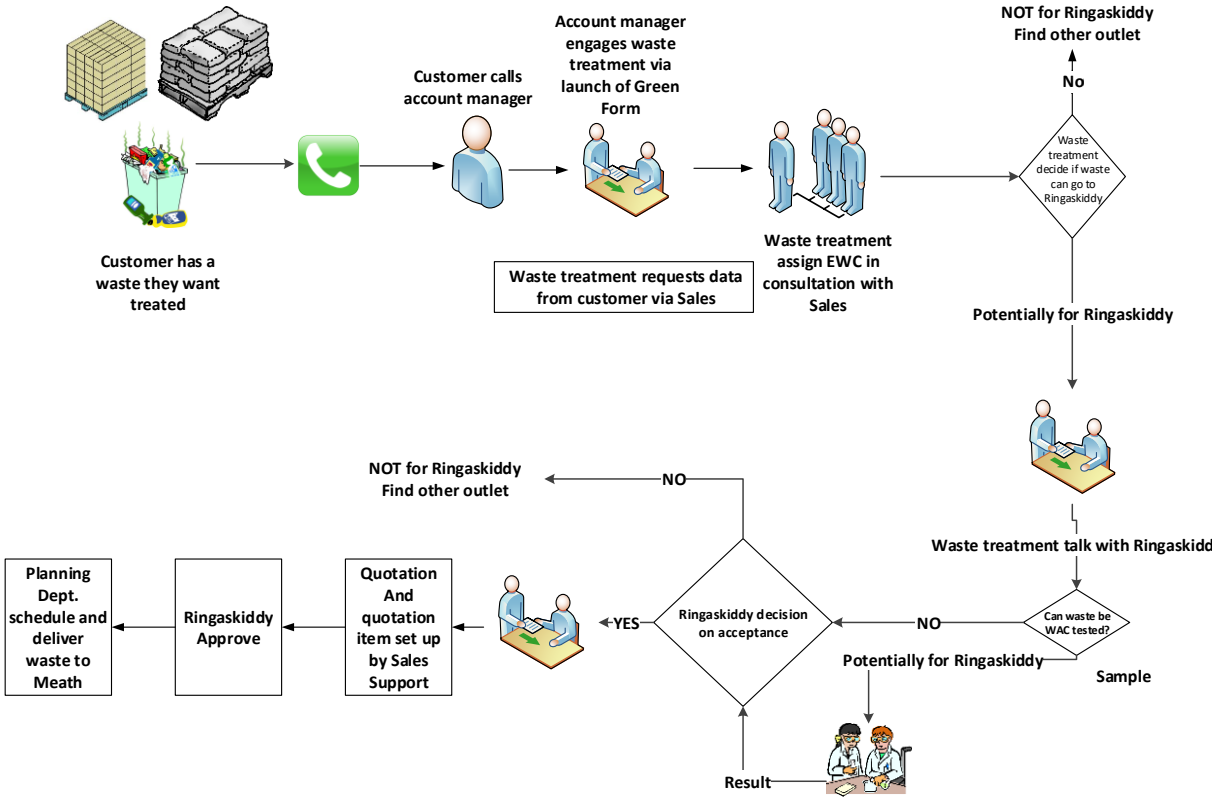


Figure 10. Process flow for acceptance of suitable hazardous waste

All waste trucks 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. Solid non-hazardous and suitable hazardous waste will arrive at the site in covered trucks.

Following completion of the waste acceptance procedures, the trucks carrying solid waste will proceed via the site road to the enclosed waste tipping hall. They will enter the supervised tipping hall and will be directed towards discharge chutes. The trucks will discharge the waste into the bunker through chutes in the wall of the tipping hall.

Aqueous wastes will also be accepted which include liquid wastes such as water waste streams with mixed solvents and/or inks, contaminated water from firefighting and clean-up operations, storm water and leachate from landfill sites etc. Solvents in

this context are solvent streams with a high water content. Aqueous wastes will be delivered by road tanker and will be sampled and analysed prior to offloading. This sampling may be done before or after arrival on site. 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.

4.6 Waste Hierarchy

The proposed development will be designed to meet the R1 efficiency criteria in Annex II to the WFD Directive as the activity proposed to be carried out will be classified as a recovery operation and will therefore contribute to moving waste away from landfill disposal to a higher tier of the waste hierarchy and thus aligns with the proper application of this order of priority.

In the context of waste streams that are transferred off-site from the waste to energy facility for treatment elsewhere, all such waste streams fall within the recovery tier of the waste hierarchy apart from three namely, water from boiler draining, foul effluent from a holding tank during annual shutdowns and a small quantity of waste to be disposed of via high temperature incineration.

As these constitute unavoidable wastes and it is not technically or economically possible to recover or recycle these wastes, they will be disposed of in a manner which will prevent or minimise any impact on the environment and in a controlled manner and in accordance with relevant licence conditions.

All other waste streams will be transferred off site to undergo appropriate recycling, reclamation or recovery operations or will be stored pending recovery or recycling. Such waste streams will be stored separately prior to transfer and will not be mixed with any other waste streams.

5.0 WASTE INCINERATION PLANT COMPLIANCE

The facility has been designed with the relevant sections of Chapter IV of the Industrial Emissions Directive (IED) in mind, namely, 44, 46, 47, 48, 52, and 53.

The plant has been designed with the categories of waste intended for treatment as a central consideration. From an early stage in the project, alternative combustion and flue gas treatment systems were considered in line with Best Available Techniques (BAT) for waste incineration as outlined below under the heading '*Best Available Techniques'*. The performance of Indaver's sister plant in Carranstown, Co Meath, was used as a benchmark as it is treating the same variety and combination of non-hazardous and suitable hazardous wastes. This plant has been treating this combination of wastes successfully since 2015.

The delivery and storage of wastes is outlined above. The waste acceptance and handling procedures outlined in Section 4.11 of the licence application will ensure the facility operates in compliance with Article 52 of the IED.

Waste gases will be treated through the flue gas system and discharged through a 70m high stack in compliance with Article 46. The proposed emission limit values

(ELVs) for the emissions to air from the stack reflect those of part 3 of Annex VI and also consider the new BAT-AEL's which will be applicable for normal operating conditions. In accordance with Article 46)6, the plant will have in place an operational procedure strictly adheres to the requirement that the plant will not continue to incinerate waste for a period of more than 4 hours uninterrupted where ELVs are exceeded.

Monitoring requirements for the emissions to air are outlined below under '*Emissions and Monitoring'*, and monitoring will be compliant with Article 48 of the IED.

As outlined above, heat generated during the incineration process will be recovered using a conventional steam boiler and electricity will be generated from the steam in a conventional turbo-generator set, as required under Article 44 of the IED.

Residues will be minimised and the residues produced, namely boiler ash, flue gas cleaning residues and bottom ash, will be managed in accordance with Article 53 of the IED. Management of these wastes is detailed further under the heading '*Nature of the Waste Activity'* above.

In accordance with Article 46)5, containment measures will also be in place to prevent accidental and unauthorised discharges to soil, surface water and groundwater. Details of these measures are outlined above under '*Storage and Handling of Waste and Raw Materials*'.

In the case of a breakdown, Indaver will reduce or closedown operations as soon as practicable until normal operations can be restored as required under Article 47.

6.0 STORAGE AND HANDLING OF WASTE & RAW MATERIALS

The storage of raw materials and wastes will be in accordance with the EU reference document on BAT for Emissions from Storage (2006). This BAT document outlines how liquids, solids and gases should be delivered, stored, and transferred to prevent and reduce emissions.

Standard Operating Procedures will be prepared to address the storage and management of chemicals and wastes, requirements for integrity testing and preventative maintenance of bunds/tanks/pipelines, and emergency response procedures. In the event of a spill or leak from a tank, the emergency response team will be trained in spill management and spill kits will be readily available.

All storage tanks will be specified in order to be compatible to what is being stored.

Tanks will be equipped with leak detection. Level alarms and leak detection (between layers for double skinned tanks, or level drops for single skinned tanks).

All bulk chemical storage tanks will be equipped with relief vents.

Bulk tanks will be double skinned or stored within designated bunds and IBCs/drums will be stored within bunded units. The design of all bunds conforms to standard bunding specifications - BS8007:1987.

No dangerous substances will be stored in the Warehouse. The chemicals stored in the self-bunded units may be flammable/dangerous; however, these are stored away from the Warehouse.

Proactive maintenance, as required under BAT, will also be undertaken. A maintenance schedule will be maintained on site for all process and service equipment. There will also be an annual scheduled shutdown for maintenance checks and advanced planning for future shutdown activities. Integrity testing of the firewater retention tank and underground pipelines will be undertaken every 3 years in accordance with the requirements of the IE licence.

6.1 Liquid Storage and Unloading Areas

The service yard to the south west of the main process building contains the following unloading and storage areas:

- Common tanker unloading area for aqueous ammonia and fuel oil,
- Fuel Oil storage tank,
- Ammonia storage tank,
- Aqueous waste storage tank and unloading area.

The unloading area for aqueous ammonia and fuel oil drains to an underground $2m^3$ tank to contain any minor spillages during unloading operations. Separate connection points will be provided for both unloading operations.

The ammonia tank will be double skinned ($80m^3$) and will be provided with leak detection. The fuel oil tank will also be double contained ($60m^3$) with leak detection. Both tanks will have top entry and exit points for the liquid transfer.

The aqueous waste unloading area will be contained and not connected to the main stormwater drainage network. In the event of a leak or spill this area will be capable of holding the full contents of a tanker ($25m^3$). The aqueous waste storage tank will be located within a bund and is $250m^3$ in size.

6.2 Storage of Solid Materials and Waste

Lime, activated carbon, flue gas residue, and boiler ash will each be stored in silos. These will be enclosed and will be equipped with HEPA filters. Preventative maintenance will be planned to check the efficacy of these filters.

Enclosed conveyors will be used for the transfer of lime, activated carbon, boiler ash, and flue gas cleaning residue.

Bottom ash will be discharged from the furnace into a water bath and then via a conveyor to the ash hall where it will be stored for a maximum of 30 days before being transferred to a collection truck using a front-end loader. All trucks leaving the facility will be securely covered to prevent any ash escaping.

7.0 MANAGEMENT SYSTEMS

7.1 Environmental Management System (EMS)

Indaver will operate an EMS which outlines the management of the site's environmental program in a comprehensive, systematic, planned and documented manner. The proposed facility will operate to ISO 9001:2000, ISO 14001 and OHSAS 18001.

The EMS will be reviewed and updated annually, as required, in accordance with the IE licence requirements. This will set out annual targets including targets for energy efficiency.

7.2 Standard Operating Procedures

Indaver is an established waste company and has well developed procedures in place for the prevention and management environmentally hazardous events. These include incident management, incident investigation, waste management, management of tanks/bunds/sumps, and management of chemicals.

7.3 Automated Control System

The facility will be controlled by an interface computer system (screens, keyboard, and printers) from the Control Room. The system will monitor all the parameters and measurements required in order to have a good overview of facility performance.

Figure 11 shows the control room at Indaver's Meath facility as an example from which all aspects of the waste-to-energy process are overseen.

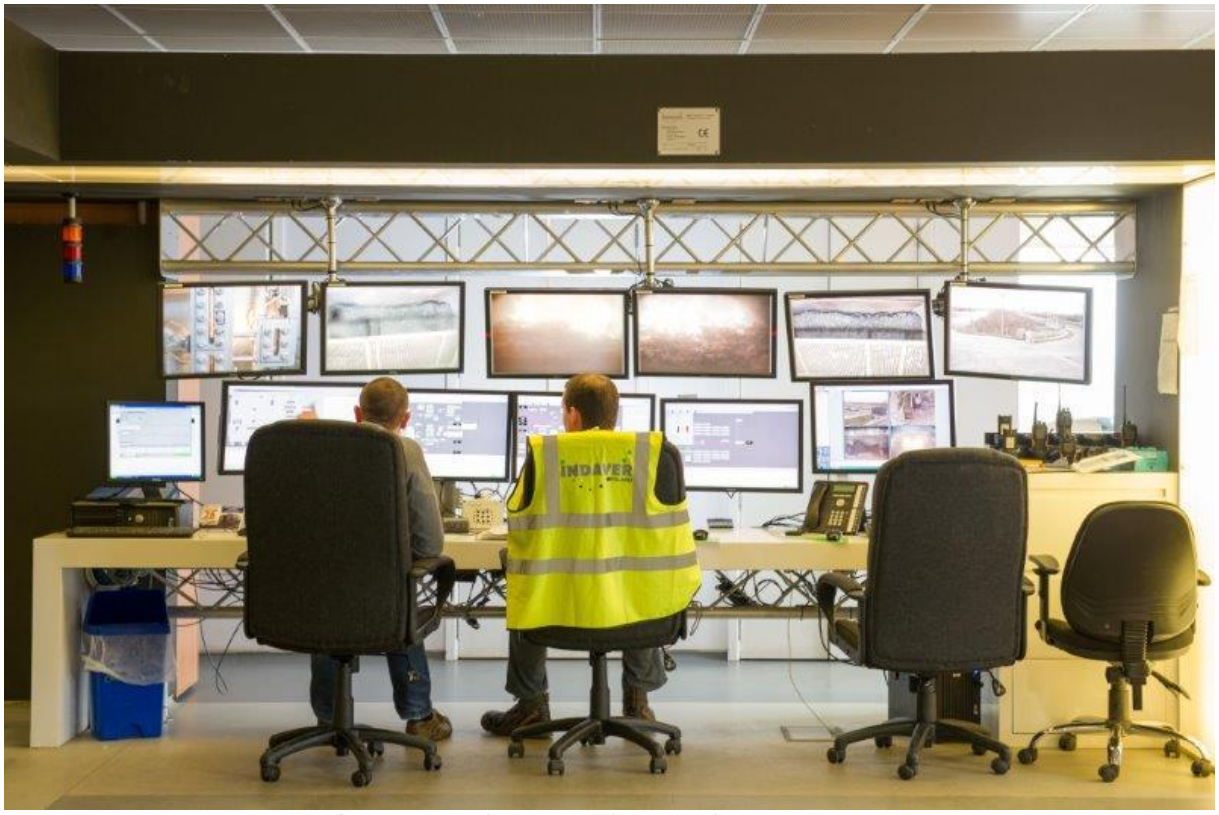


Figure 11. Indaver Meath Control Room

8.0 EMISSIONS AND MONITORING

8.1 Emissions to Air

8.1.1 Flue gas emissions

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 as outlined above.

The cleaned flue gases are discharged through the stack by the induced draft (ID) fan. The stack is 70m tall (from site ground level) and has been designed as part of the Air Quality assessment to ensure that ambient air quality standards for the protection of human health will not be approached even under abnormal operating scenarios.

The relevant limits for emissions to air are set out in the EU Industrial Emissions Directive 2010/75/EC. The emissions to atmosphere which have been regulated for the Ringaskiddy facility are:

- Nitrogen Dioxide (NO_2)
- Sulphur Dioxide (SO_2)
- Total Dust (although there is no regulated Total Dust standard, standards exist for PM_{10} and $PM_{2.5}$ (particulate matter less than 10 and 2.5 microns respectively))
- Carbon Monoxide (CO)
- Total Organic Carbon (TOC)
- Hydrogen Fluoride (HF) and Hydrogen Chloride (HCl)
- Dioxins/Furans (PCDD/PCDFs)
- Cadmium (Cd) & 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).

Flue gas monitoring equipment will be installed to monitor emissions. The equipment will consist of continuous monitors and regular grab sampling according to the specifications laid down in EU and Irish legislation for incineration facilities. The following parameters will be continuously measured in the stack: total dust, TOC, HCl, HF, SO_2, NO_x, CO, NH_3, Hg, temperature and O_2. These continuous measurements will be accessible in 'real time' in the control room.

The emission values will be relayed to both the control room, where the operators will have 24-hour access to this information and will be able react if necessary, and to the QESH (Quality, Environmental, Health & Safety) Department where they will be monitored for compliance with the relevant half-hourly, daily and monthly averages.

Although it is not a requirement of EU or Irish legislation, the monitoring equipment will include a state-of-the-art continuous dioxin sampler. The continuous dioxin sampler will allow the dioxin emissions to be sampled continuously. A dioxin filter will be placed in the stack to collect dioxin emissions on a fortnightly basis.

This will then be removed and analysed in an independent laboratory. Laboratory testing of the samples will give dioxin emission concentrations and mass emission rates over a two-week period. This equipment is in use in existing Indaver facilities such as the Waste-to-Energy facility in Meath.

Monitoring for heavy metals Cadmium, Thallium, Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel, and Vanadium will also be completed biannually.

8.1.2 Minor emissions

Minor emissions will consist of the following:

- HVAC exhausts containing particulates and CO (minor),

- Steam from the boiler blow down tank and boilers start-up valve,
- Particulates and ammonia from the solidification plant,
- Diesel vapour from the diesel tanks,
- Extraction from the lab fume hoods,
- Welding booth extractions,
- Particulates from the deslagger extraction, and
- Odour emissions from the process building (abated using the Activated Carbon/Bio Filter system),

Due to the nature of these emissions (i.e. steam or hot air emissions only), or the quantity of the emission (i.e. only minor or trace levels of pollutants), these points have been designed as minor and are not anticipated to have a significant impact on the ambient air quality.

8.1.3 Potential Emissions

Potential emissions include relief valves on the aqueous waste storage tank and ammonia storage tank, as well as steam emissions from the air condenser safety valves and rupture disks, boiler main and boilers drum safety valves, high pressure steam header valve, and the boiler feedwater safety valves.

There is 1 no. emergency diesel generator and 3 no. diesel powered fire pumps listed as potential emissions as these will only be used in the case of emergencies.

Due to infrequent operation of these units and/or the scale of the associated emission it is not anticipated that these emission points will have a significant detrimental impact on ambient air quality.

8.1.4 Fugitive Emissions

Fugitive emissions from a plant of this nature may consist of dust and odour. No fugitive emissions are anticipated, however, as the facility will be held under negative pressure which will prevent the generation of fugitive emissions.

8.2 Emissions to Sewer

There will be no process effluents or other industrial wastewater discharges associated with the proposed development.

The only wastewater from the proposed development will be domestic sewage from toilets, changing and kitchen areas which will discharge via the foul drainage system and will be pumped directly to the Irish Water sewer located east of Ringaskiddy Village, which will then be pumped to the Shanbally Wastewater Treatment Plant (WWTP).

8.3 Emissions to Stormwater

The storm water from all of the roads and hard standings will be conveyed via a class 1 hydrocarbon interceptor to the fire water retention tank (Tank No. 1). The fire water retention tank will have a capacity of 1,690m^3.

The storm water from the roofs of all of the buildings will be conveyed to the surface water attenuation tank (Tank No. 2). The surface water attenuation tank will have a capacity of 1,250m^3.

The proposed development will only have one stormwater emission to the storm sewer, SW-1. This will be the discharge from Tank No. 2. The discharge will enter the storm sewer along the road of which the outfall is into Cork Harbour at Gobby Beach.

The discharge from Tank No. 2 will be monitored continuously for total organic carbon (TOC), pH and conductivity and will be sampled for any other parameters required by the EPA licencing procedures. Continuous monitoring will also be in place on the inlet to Tank No. 1 and any exceedances will trigger the automatic isolation of the firewater tank from the attenuation tank.

Proposed final discharge from the site will be controlled using a pump from the surface water attenuation tank up to and including the 30-year rainfall event.

Regular visual inspections will also be undertaken for the stormwater at the final discharge point.

8.4 Emissions to Surface Water

There are no emissions directly to a surface water body.

8.5 Noise Emissions

The primary potential noise sources during the operation of the proposed facility are associated with the process and building services plant, vehicle movements on site, and additional vehicles on public roads. There are no expected vibration sources associated with the operational phase.

Annual day time, evening and night-time monitoring will be undertaken at the installation in accordance with the IE licence requirements in the operational phase.

8.6 Emissions to Ground

There are no proposed emissions to ground or to groundwater.

A total of 3 no. groundwater monitoring wells (MW-1 to MW-3) will be installed across the site for the purpose of undertaking regular groundwater monitoring as will be a requirement of the IE licence. The monitoring will detect any changes in groundwater quality during the operational phase of the facility.

Soil monitoring will also be undertaken every 10 years at 2 no. boreholes (locations to be agreed with the Agency).

9.0 MITIGATION MEASURES/ABATEMENT

Indaver will implement appropriate mitigation measures in order to protect the surrounding site environment and to follow regulations and limits set by legislation.

9.1 Air Abatement Measures

9.1.1 Flue Gas Treatment System

Air emissions from the stack will be controlled through both process optimisation (e.g. waste acceptance procedures and management of furnace operations) and physical / chemical treatment (in the flue gas treatment system). These systems have been designed to ensure emissions from the stack are well below the limit values set out in the EU Industrial Emissions Directive 2010/75/EC.

As described above, a flue gas treatment system will be installed which will comprise of a cooling section a dry reactor, a bag house filter, and an induced draught fan to maintain the flow through the treatment system. The final emission from this system will be emitted through a stack with a height of 70m above ground level.

These abatement system s have been selected and designed to ensure that the new BAT AEL's and IED limits will be met.

9.1.2 Minor Emissions and Abatement

In relation to the HVAC exhausts from the proposed development, the two HVAC exhausts from the bottom ash building will emit air which has been passed through a HEPA filter (or similar as agreed with the EPA) prior to emission in order to ensure dust emissions are negligible. The air emitted from the HVAC exhaust on the administration building will be passed through a HEPA filter to ensure particulate emissions are minimised.

Emissions from the solidification plant at point will pass through a water bath to ensure levels of particulates as well as trace ammonia concentrations are minimised. This is a similar design to the Indaver Carranstown Waste-to-Energy facility.

Any odours present in the air of the process building and tipping hall will be treated by extraction and use as primary air in the combustion process. When the plant is in shutdown (1-2 weeks per annum) the extracted air will be treated by an activated carbon filter or biofilter to remove any odours before being vented to the external environment. The potential for odour impact on the receiving environment is therefore negligible.

The potential for particulate emissions from the three compressor exhausts at the proposed facility will be negligible as the intake air for the compressors is filtered.

9.2 Stormwater Abatement Measures

The network has been designed to minimise any potential for off-site impacts. Drainage from roofed areas will collect in one network and all other areas of hardstanding will be collected in another.

2 no. Class 1 Full Retention Hydrocarbon interceptors will be installed on the storm water drainage line draining surface water from the roads and hard stand areas to the firewater retention tank. All separators on-site will be fitted with an oil alarm system which will be tied back to the building management system in accordance with BS EN 858-1.

The tanker unloading area (for aqueous ammonia and fuel oil), which is located adjacent to the fuel tank, will be provided with cut off drains to collect any spillage that may occur during loading or unloading. A local holding tank with a $2m^3$ capacity

will be provided. The outlet valve of the local holding tank will be closed during any tanker unloading operation.

If a spillage occurs during a loading or unloading operation, the spilled liquid will be collected in the local holding tank. The contents of the tank will then be pumped out and dealt with appropriately. When the unloading operation has finished, if no spillage has occurred, the valve will be opened, and the contents of the tank will drain via a forecourt interceptor to the fire water retention tank.

A separate fully contained unloading area for aqueous waste deliveries will be located adjacent to the aqueous waste storage tank. This area will act as a bund in the event that there is a loss of the full contents of an aqueous waste delivery ($25m^3$) and will not be connected to the main storm water drainage network in this area. See Figure 12 below which demonstrates this.

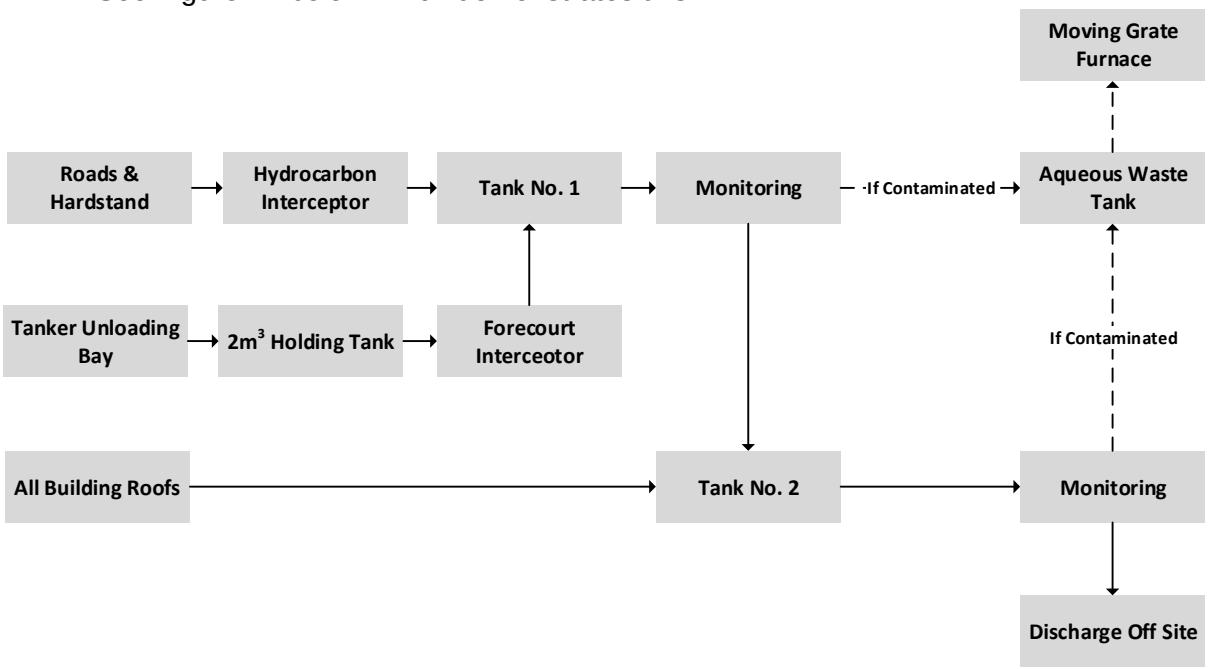


Figure 12. Stormwater Abatement Systems

9.3 Noise Abatement Measures

Practicable noise control measures will be employed to ensure that noise from process and building services plant do not exceed the operational noise limits. Acoustic attenuators will be required for the aero condenser structure to meet the required levels.

In addition, 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.

Additional measures for mitigating the noise from additional vehicles on public roads are not required.

10.0 POLLUTION PREVENTION AND MEASURES TO MINIMISE EMISSIONS

10.1 Minimisation of Emissions to Air

The facility will be compliant with the requirements of the EU Commission's Waste Treatment BAT reference document (October 2018) which includes the requirement to prevent, or where that is not practical, reduce emissions to air, in particular of dust, organic compounds and odour.

As part of the design of the facility the project engineers identified a number of measures to limit emission sources and improve the integrity of process equipment and connections etc. Commissioning will be overseen by suitably qualified engineers to ensure the required performance criteria are achieved.

With regard to fugitive dust emissions, the potential for fugitive dust will be minimised at source by the following prevention measures:

- All road and yard surfaces will be paved to minimise dust generation.
- Vehicles delivering waste material will be enclosed or covered to restrict the escape of dust.
- Waste storage, treatment and handling operations will take place within the confines of the waste tipping hall and bunker. The bunker will be large enough to allow acceptance of waste during periods of shutdown, so waste will never be stored externally.
- The storage, treatment and handling of any other solids and plant cleaning operations will be carried out in fully enclosed environments. No solids will be stored in the open at the site.

The controls above incorporated into the design and operation of the facility will prevent significant emissions of fugitive dust. Dust and particulate levels will be compliant with ambient air quality limit values and the German TA Luft standard for dust deposition at all locations beyond the site boundary.

No fugitive odour emissions are anticipated from the proposed development as the waste tipping hall and bunker will be maintained under negative pressure to prevent fugitive emissions and the air extracted from these spaces will be used as primary air in the combustion process. This will minimise the risk of odours escaping the building. If for any reason the waste-to-energy facility is shut down (typically for 1 or 2 weeks per year), the main fans for combustion air and flue gases will be kept in operation for as long as possible to maintain the tipping hall under negative pressure. When the main ID fan is switched off, then the air will continue to be extracted through a biofilter unit or activated carbon unit.

10.2 Minimisation of Emissions to Water

The facility does not produce industrial wastewater. Management of stormwater emissions will be through the abatement systems employed.

The facility will be sealed with continuous concrete hard stand. The waste handling building will be covered.

The following containment arrangements are planned to be in place at the site to prevent any accidental release of hazardous substances, including substances that may be hazardous to the environment:

- The ammonia solution and light fuel oil tanks are double skinned with leak detection systems and have over-fill protection in the form of level switches/ interlocks.
- The bulk storage tanks are located on hard standing ground.
- The drainage channel in the delivery area, where the light fuel oil and the ammonia solution are unloaded, are planned to discharge to a Class 1 by-pass petrol interceptor (where any oil spills can be separated or partially contained if required) via a $2m^3$ holding tank which will be isolated during loading and unloading operations in this area.
- A separate unloading area will be provided for the aqueous waste deliveries adjacent to the aqueous waste storage tank. This area will be fully contained and will have the capacity to contain the full contents ($25m^3$) of a tanker.
- All run-off from the road and hardstand area drain direct to the firewater retention tank which is to be monitored continuously. In the event of an out of specification reading, this tank can be isolated from the stormwater attenuation tank and the water removed. The arrangement allows for the roof run-off to discharge independently via the stormwater attenuation tank. Monitoring will also take place at the outlet of the stormwater attenuation tank. If required, the outlet valve will be closed automatically and contaminated water from either tank removed by tanker to the aqueous waste tank for appropriate disposal.
- The ammonia solution and light fuel oil pipelines run on over ground tray racks above hardstanding areas to the process building. There are no underground process lines at the facility.
- All containers storing materials that are hazardous to the environment are stored over paved areas and chem store units with spill trays are used for any chemical stores in the contractors' compound (warehouse area).
- Drains will be painted for high visibility and in accordance with conditions set out in the final IED Licence.
- The waste bunker which extends below ground is designed to be water-retaining and will have concrete walls over 1 metre thick.

10.3 Minimisation of Emissions to Noise

Control of noise was considered as part of the detailed design of the installation, and abatement measures are detailed above.

A noise management plan including noise monitoring will be outlined in the installation's EMS.

10.4 Waste Minimisation

Indaver is committed to minimising the environmental impact of its operations and the proposed waste management process for the installation is considered an essential and integral component in the efficient operation of the installation.

The facility will operate under an EMS which outlines the management of the site's environmental program in a comprehensive, systematic, planned and documented manner.

The proposed facility does not presently participate in any projects under the National Waste Prevention Programme. However, consideration will be given to future participation in this Programme.

Indaver will evaluate its chemical and raw materials list at least annually to determine whether chemicals are unnecessary or unused and efforts will be made to minimize use of such chemicals in the future.

10.5 Groundwater Protection

It is very unlikely that any of the liquids stored onsite will become entrained in the stormwater run-off based on the contingency systems (double skinned or bunded tanks) and mitigation systems (Class 1 hydrocarbon interceptors, automated monitoring and cut off valves) incorporated into the process design. As such, the site operations are unlikely to have a significant impact on the quality of the receiving environment.

Roads, hard standings, and yard areas within area of the licenced installation will be paved and surface water run-off from such areas and from the roofs of the buildings will be collected in the surface water drainage system. This will reduce the infiltration of surface water into the groundwater and have a minor impact on the groundwater flow regime under this part of the site.

Source-pathway-receptor linkages were assessed for the bulk storage areas as part of the Soil & Groundwater Baseline Assessment. It was concluded that there are no direct pathways to either the soil and groundwater environment or the surface water environment. A leakage from a bulk tank would be fully contained in the designated bund or the double skin lining of the tank, with leaks during delivery fully contained within the continuous hard stand delivery area. Any leakage outside of the delivery area would be contained within the closed drainage system.

Operation of the plant will be according to BAT (Best Available Technology) principles and in compliance with the licence for the site to ensure that inputs to, and any subsequent contamination of, soil and water environments does not occur during normal and/ or emergency conditions (material spillage or fire event situations).

An environmental management plan (EMP) will be in place to ensure compliance with licensing requirements. This will include full and adequate containment and management of potential contaminants. Site-specific emergency response measures will also be in place and all relevant personnel will be trained accordingly.

11.0 COMPLIANCE

11.1 Air Emission Limits

There will be one main air emission source resulting from activities at the proposed site, referred to as *A2-1 Waste-to-energy plant stack*. Emissions leaving the stack will pass through an extensive flue gas treatment system designed to ensure compliance with the ELVs for waste incineration set out in the IED.

As the facility has been designed with compliance in mind, it is anticipated that the facility will comply with the relevant ELVs for each of these parameters once the facility is operational.

11.2 Stormwater Emissions

Due to the nature of the run-off from the existing facility and the inclusion of hydrocarbon interceptors, the proposed discharge is unlikely to contain more than trace hydrocarbons. It is not anticipated that the surface water quality will exceed the Environmental Quality Standards as set out in SI 272 of 2009 and SI 386 of 2015 (Surface Water Regulations).

11.3 Noise Emissions

The following standard noise criteria are anticipated to apply at the nearest noise sensitive locations (NSLs):

- Daytime (07:00 to 19:00hrs) 55dB $L_{Ar,15min}$
- Evening (19:00 to 23:00hrs) 50dB $L_{Ar,15min}$
- Night time (23:00 to 07:00hrs) 45dB $L_{Aeq,15min}$

The proposed waste-to-energy facility has been assessed against the relevant operational noise ELV's prescribed within the EPA's noise guidance document *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities* (NG4, EPA 2016) at the closest noise sensitive locations. The assessment has concluded that due to the distance between the proposed development and the nearest sensitive buildings, the proposed site layout and the recommended noise mitigation measures, the facility can operate within the adopted day, evening and night-time noise limit values.

11.4 Groundwater Quality

Groundwater samples were collected and analysed as part of the Soil and Groundwater Baseline Assessment completed for the application. The results showed that the groundwater quality at the site complies with the Groundwater Threshold Values (GTVs) from the European Communities Environmental Objectives (Groundwater) Regulations, S.I. 9 of 2010 & S.I. 366 of 2016, and the EPA Interim Guidelines for groundwater, where available.

On the basis of the chemicals stored and the mitigations measures proposed, it is considered that other than those parameters that are natural elevated in the local groundwater body, there will be no significant impact on the quality of the groundwater status of the Limerick Ringaskiddy GWB from the site operations. As such, it is anticipated that the site operations will not result in additional exceedances in the GTVs.

11.5 Best Available Techniques

The Plant will operate in a way that is compliant with the EU reference document on BAT for Waste Incineration (2006) as well as the EU reference document on BAT for Waste Treatment (2018). The emphasis in these BAT reference documents is on minimising and controlling emissions through a preventative approach.

As outlined above, the facility is designed to minimise emissions from the storage and handling of wastes, and operating procedures will be in place to control the movement of wastes and manage incidents if and when they should occur. The storage of wastes and raw materials has also been assessed against the EU reference document on BAT for Emissions from Storage (2006) and further details on

the storage principles are described above under *'Storage and Management of Wastes and Raw Materials'.*

Monitoring of the emissions from the facility is outlined below above '*Emissions and Monitoring*'. Monitoring will be in compliance with the BAT document on Waste Treatment as well as the EU reference documents on BAT for General Principles of Monitoring (2003) and BAT for Monitoring of Emissions to Air and Water from IED Installations (2018).

The flue gas abatement system for the waste gases produced in the incineration process has been designed in accordance with the BAT for Waste Incineration. The flue gas system is described above under '*Nature of the Waste Activity'.*

Finally, the design of the facility has been assessed for compliance against the EU reference document on BAT for Energy Efficiency (2009). Energy management is described further below.

12.0 ENERGY MANAGEMENT

Energy efficiency in considered during the design phase and in particular to ensure that the R1 status of the facility can be guaranteed.

The choice of flue gas cleaning technologies deployed in the facility have also taken energy consumption into consideration.

The steam parameters for the boiler have also been chosen to optimise the recovery of heat for conversion into electrical energy whilst considering any adverse corrosion effects in the boiler.

The usage of variable speed drives for pumps and other equipment is favoured (where applicable) in order to reduce energy consumption.

Indaver Ireland Ltd. is committed to the Energy Efficiency Directive to help the EU to reach its 2020 energy efficiency targets.

13.0 EXISTING ENVIRONMENT

13.1 Hydrological Environment

The undeveloped site is drained through natural channels along field boundaries following the natural topography towards the north east. The relatively flat and low lying areas in the north of the site, to the east and west of the Hammond Lane facility are more poorly drained, with ponding noted in winter. This is most likely due to the gradient and presence of thicker low permeability glacial deposits in this area.

Once the site is developed, the storm water runoff will be discharged to the Local Authority sewer located in the L2545 road to the north of the site. The outfall is into Cork Harbour at Gobby Beach. For the purposes of this assessment the receiving environment is considered to be the Cork Harbour.

As per the EPA's *Envision* Database the coastal water body risk score for Cork Harbour IE SW 060_0000 is "under review". The water quality status is determined as "Good".

Cork harbour is a working port heavily influenced by the existing industrial, commercial, energy production/transmission, and port related uses in the Ringaskiddy and Lough Beg area, as well as being part of a much larger and mixed use harbour.

13.2 Soils and Geology

Information obtained from the GSI (2018) indicates a sequence of different lithological groups within the area surrounding the site. The site is underlain by Lower Carboniferous marine interbedded grey/brown sandstone, siltstone and mudstone referred to as the Cuskinny Formation of the Kinsale group. Site investigations confirmed pale green Mudstone/green grey fine-grained Sandstone. Depth to bedrock varies across the site, from 0.3 m below ground level (bgl) in the centre of the site, to 10.1 m bgl in the east of the site.

According to the GSI (2018), the natural subsoil type located at the site is predominantly glacial tills (carboniferous limestone till). The Teagasc Subsoils Map shows that that the region is predominantly till derived from Devonian sandstones, with some areas of till derived from Namurian shales and sandstones and from Carboniferous limestone.

The EPA soil mapping classifies the upper soil profile as acid brown earths that are glacial in origin derived from Old Red Sandstones and Carboniferous Limestone.

Site investigations during 2000 and 2001 by K.T. Cullen & Co. Ltd. showed that topsoil overlies brown gravelly Clay and brown gravelly Silt beneath the Indaver site. Pockets of localised Sand and Made ground were also encountered on the adjacent Hammond Lane site.

Seven representative soil samples were collected during the soil investigation undertaken in 2018. The results indicated that there was no significant soil contamination at the site. All results were below the threshold for land suitable for commercial use.

13.3 Hydrogeology

The groundwater body of Ringaskiddy is 16.7 km^2 in area and occupies an east west trending valley on the west side of Cork Harbour. Much of the Ringaskiddy groundwater body comprises urban and/or industrial areas. Currently, the EPA (2018) on-line mapping classifies the Ringaskiddy water body as having ‘Good Status’, with a WFD risk is “under review”.

The aquifer is moderately productive but is not used extensively locally for water supply. There are no source protection areas noted within 2 km of the site (source GSI, 2018).

The National Parks and Wildlife Service online database was consulted to establish whether any groundwater-dependent terrestrial ecosystems are located within 2km of the site of the proposed development. No groundwater-dependent ecosystems within 2kms of the proposed development were identified from the database.

Samples were taken in 2000/2001 from 5 no. boreholes (BH1 – BH5). Analysis for hydrocarbons, Volatile Organic Compounds (VOCs) and PAHs, Polychlorinated

BiPhenols (PCBs) and pesticides also showed no exceedances above laboratory detection limit.

A further sample for one borehole (BH4) was taken in 2018 and metals, VOCs, Semi Volatile Organic Compounds (SVOCs), PCBs and hydrocarbons (EPH CWG). Groundwater results were compared with Groundwater Threshold Value (Groundwater Directive S.I. No. 9 of 2010 and amendment; S.I. No. 366 of 2016) and EPA Interim Guidelines for groundwater where available. All metals were below threshold concentrations and all other parameters were mostly below the laboratory limit of detection and results showed no exceedances above relevant threshold concentrations.

13.4 Ambient Air Quality

An extensive baseline survey was carried out in the region of the proposed Ringaskiddy Resource Recovery Centre facility over the period October 2018 to January 2019. This supplements the extensive baseline surveys undertaken in November 2006 to February 2007, from April 2008 to July 2008 and August 2014 to July 2015. These 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 substances monitored over these survey periods were NO_2, NO_X, PM_{10}, $PM_{2.5}$, benzene, SO_2, heavy metals, HCl, HF and PCDDs/PCDFs. The air monitoring program was used to determine long-term average concentrations for these pollutants in order to help quantify the existing ambient air quality in the region. NO_2, benzene and SO_2 were also monitored at a number of additional locations to give some spatial representation of the levels of these species.

The updated extensive baseline survey which was carried out in the region of the proposed Ringaskiddy Resource Recovery Centre facility over the period October 2018 to January 2019 focused on NO_2, PM_{10}, $PM_{2.5}$, benzene, SO_2, HCl, HF, PCDDs/PCDFs (dioxins/furans) and heavy metals over a 3-month long period. The air monitoring program was used to determine long-term average concentrations for these pollutants in order to help quantify the existing ambient air quality in the region. NO_2, benzene and SO_2 were also monitored at a number of additional locations to give greater spatial representation of the levels of these species.

Below is a summary of the results from the baseline survey:

- During the monitoring period no exceedance of the 1-hour limit value of 200 $\mu g/m^3$ for Nitrogen dioxide (NO_2) was observed whilst the mean over this period was 10.1 $\mu g/m^3$ which is 25% of the annual NO_2 limit value. The average NO_2 concentration measured over the three-month period at each location ranged 16 - 42% of the EU annual limit value of 40 $\mu g/m^3$. The results indicate a weak NO_2 spatial concentration gradient in the region.
- The average PM_{10} concentration measured over the three-month period is only 40% of the EU annual limit value of 40 $\mu g/m^3$. The average $PM_{2.5}$ concentration measured over the three-month period is 14.9 $\mu g/m^3$ which is below the annual average EU limit value of 25 $\mu g/m^3$. A $PM_{2.5}/PM_{10}$ ratio for the monitoring period of 0.88 has been calculated.
- The average SO_2 concentration measured over the three-month period at each location was between 11% – 68% of the EU annual limit value of 20 $\mu g/m^3$ for the protection of vegetation.
- The average benzene concentration measured over the three-month period at each location were between 16% - 69% of the EU annual limit value of 5 $\mu g/m^3$.

- The average HF concentration measured over the three-month period was only 2% of the UK annual limit value of 16 µg/m^3. The average HCl concentration measured over the three-month monitoring period was 11% of the UK annual limit value of 20 µg/m^3.
- The average concentrations of antimony (Sb), arsenic (As), cadmium (Cd), cobalt (Co), chromium (Cr), copper (Cu), mercury (Hg), manganese (Mn), nickel (Ni), lead (Pb), thallium (Tl) and vanadium (V) were significantly below their respective annual limit values, with average levels reaching only 0.04% - 47% of these limits.
- Background levels of PCDD / PCDFs cannot be compared to ambient air quality concentration or deposition standards. However, levels of PCDDs and PCDFs can be compared to existing levels measured sporadically in Ireland and continuously in the UK as part of the TOMPS network. The mean PCDD/PCDF concentration measured over the period October 2018 – January 2019 indicates that results are in line with measurements conducted elsewhere in Ireland, with an upper limit of 21.5 fg/m^3 compared to previous measurements ranging from 2.8 – 46 fg/m^3.

13.5 Existing Noise Environment

A baseline noise survey was undertaken as part of the EIAR to determine the prevailing noise environment during day, evening and night-time periods in the vicinity of the nearest noise sensitive locations (NSLs) to determine the baseline noise environment and to determine the relevant operational criteria for the proposed facility. The survey comprised both attended and unattended measurements.

Attended noise measurements were recorded during daytime (07:00 to 19:00hrs), evening (19:00 to 23:00hrs) and night-time (23:00 to 07:00hrs) periods. The daytime measurements were dominated by traffic noise and activities within adjacent facilities. Evening and night time measurements were influenced by passing intermittent traffic and faint plant noise.

13.6 Ecologically Designated Sites

The Geological Society of Ireland (GSI) and National Parks and Wildlife Service (NPWS) on-line databases presently list no ecological designated areas within or the proposed development site.

As outlined in Chapter 12 of the EIAR there are a number of designated sites within the 20km zone of influence including the Cork Harbour Special Protection Area (Site code 004030) approximately 0.5km to the south of the site, the Great Island Channel candidate Special Area of Conservation and proposed Natural Heritage Area (Site code 001058) 5.6km north of the site, the Lough Beg proposed Natural Heritage Area (Site code 001066) approximately 0.3 km south of the site, and the Monkstown Creek proposed Natural Heritage Area (Site Code 001979) 1.5km northwest of the site. The EIAR identifies these as being important sites for bird species in the Cork Harbour and are therefore relevant to the proposed development.

Other designated sites within the zone of influence were also identified, however the EIAR concluded that these were a considerable distance from the proposed development and would not be potentially impacted by the proposed development.

14.0 PREDICTED IMPACTS

14.1 Air Quality

Impacts from Main Air Emissions

The likely effect of the proposed development on air quality was assessed as part of the EIAR. The assessment scope comprised the following components:

- Review of maximum emission levels and other relevant information needed for the modelling study;
- Identification of the significant substances released from the site;
- Review of background ambient air quality in the vicinity of the plant;
- Air dispersion modelling of significant substances released from the site;
- Particulate deposition modelling of Dioxins and Furans, Polycyclic Aromatic Hydrocarbons (PAHs) and heavy metals released from the site;
- Identification of predicted ground level concentrations of released substances at the site boundary and at sensitive receptors in the immediate environment;
- A full cumulative assessment of significant releases from the site taking into account the releases from all other significant industry in the area; and
- 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.

A detailed baseline air quality assessment was carried out to assess background levels of those pollutants that are likely to be significant releases from the proposed development. Operational models were developed (AERMOD and CALPUFF) to assess the effect of the proposed facility under maximum and abnormal conditions. A conservative approach was adopted to ensure an over estimation of effects. Such an approach will result in the adoption of emission standards that protect ambient air quality.

Modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards for the protection of human health for all parameters under maximum and abnormal operation of the facility. Thus, no adverse effect on public health or the environment, including the Cork Harbour SPA, is envisaged to occur at or beyond the facility boundary.

Impacts on Climate

As part of the EIAR, Indaver has considered the effects of the proposed development on climate change and the vulnerability of the proposed development to climate change. With regard to effects on climate, Indaver considered how the proposed development will impact on both the emission of greenhouse gases and the consumption of renewable energy

The EIAR chapter on Climate (Chapter 9) concluded that the contribution to total greenhouse gas emissions is minor in the context of strategic infrastructure. In addition, the export of surplus electricity to the national grid (18.5MW) will have a direct benefit in terms of preventing greenhouse gas emissions from the production of that electricity in a fossil fuel based power stations. Some of the energy generated is renewable and will displace energy currently generated via fossil fuels. In the absence of the proposed facility, waste would be collected and disposed of to landfill or exported for incineration in Europe. Landfills produce methane which is twenty eight times more powerful than carbon dioxide as a greenhouse gas, and by diverting

waste from landfill, the negative effect of the production of methane is avoided. Reducing the export of residual waste will also reduce carbon emissions from transport of waste.

Impacts from Minor and Potential Emissions

Due to the nature of the emissions or the employment of abatement, the impact on the receiving environment from the minor air emissions is considered insignificant.

Impacts from Fugitive Emissions

No significant impacts to the receiving environment are expected as a result of fugitive dust or odour emissions as these emissions will be minimised at source.

14.2 Sewer

During the operation of the proposed development, sanitary wastewater will be pumped directly to the Irish Water sewer located east of Ringaskiddy Village, which will then be pumped to the Shanbally WWTP where it will be appropriately treated so as to avoid any significant adverse impact on the environment.

14.3 Surface Water

The storm water runoff will be discharged to the Local Authority sewer located in the L2545 road to the north of the site. The outfall is into Cork Harbour at Gobby Beach. For the purposes of this assessment the receiving environment is considered to be the Cork Harbour.

Chapter 13 of the EIAR concludes that with the implementation of the mitigation measures proposed, the development will not result in significant negative effects on the surface water quality of the area or the receiving waterbody (Cork Harbour).

The relevant Principle Polluting Substances of concern, with regards to S.I. No. 283/2013 - Environmental Protection Agency (Integrated Pollution Control) (Licensing) Regulations 2013 will be hydrocarbons, ammonia and the aqueous waste. The storage and management of these chemicals is outlined above under *'Pollution Prevention and Measures to Minimise Emissions'*. As such, there is a very low risk of Principle Pollution Substances being discharged from the facility via the stormwater network.

14.4 Noise

A noise model of the proposed facility was developed to assess the noise contribution from all noise generating operating sources and internal traffic movements. This included an assessment of the cumulative effects of the proposed development in terms of noise and vibration taking into account the existing environment coupled with the proposed resource recovery centre.

The assessment has concluded that due to the distance between the proposed development and the nearest sensitive buildings, the proposed site layout and the recommended noise mitigation measures, the facility can operate within the relevant day, evening and night-time noise limit values. In summary, the noise and vibration effects will not be significant at noise sensitive locations near the development.

14.5 Groundwater

There are no direct discharges proposed to groundwater or soil environment during operation. As such, the only significant impact that could only occur is due to accidental emissions such as localised accidental leakages from cars/vehicles in the car park areas on-site or accidental leakage or spillage of process materials or wastes, particularly during unloading or loading operations.

The relevant substances under European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), of which is giving effect to giving effect to EU Directive 2006/118/EC, are Ammonium Hydroxide (NH_4OH) Solution and Light Fuel Oil. Aqueous wastes may also fall into this category depending on the make-up of the waste at any given time.
As outlined above, the facility has been designed to provide sufficient control of these substances during storage and handling. Operational procedures will be in place to ensure adequate action is undertaken in the event of a spill or other incident.

As such, it is not anticipated that the site operations will have a significant detrimental impact on the groundwater quality, and it is determined that the measures proposed are sufficient to comply with the requirements of the Council Directives 80/68/EEC and 2006/118/EC for the protection of groundwater.

14.6 Biodiversity

Chapter 12 of the EIAR considered the impacts of both construction and operations on the surrounding terrestrial and marine habitats and the potential for the proposed development to impact upon specific species. The EIAR concluded that the proposed mitigation measures are sufficient to prevent adverse impacts on the local biodiversity (with the exception of localised residual impacts resulting from the loss of common habitats on the site itself due to the development).

The EIAR also concluded that the emissions from the facility will have a negligible impact on the marine ecology and the important bird populations within the Cork Harbour.

An NIS was completed for the proposed development in order to assess whether the mitigation measures proposed as part of the development including the design of the facility were sufficient to prevent significant adverse impacts occurring to designated sites as a result of the development. This assessment concluded that the proposed development will not have an adverse impact on the integrity of any Natura 2000 sites including the Cork Harbour Special Protection Area.

14.7 Cross-boundary Impacts

There are no anticipated impacts over long distances or outside the territory of Ireland as a result of the proposed changes onsite.

All proposed air emissions and monitoring will be compliant with ambient air quality standards and will not have a transboundary impact.

All proposed sewer emissions and monitoring will not result in transboundary impacts on the downstream wastewater treatment plant.

All other changes are minor and will have negligible impacts on the environment as a whole.

15.0 RISK MANAGEMENT AND LIABILITY

15.1 Risk Management

In terms of risk management, the installation will operate to a wide variety of Standard Operating Procedures (SOPs). These include SOPs on spill prevention and control, incident investigation & reporting, hazard identification and risk assessment, and transfer and storage of materials and wastes.

Indaver operate a combined Quality, Environmental, Safety and Health (QESH) Management System. The QESH policies are high level documents which define Indaver's environmental and health and safety objectives and set out the control of the possible impacts from the activities.

Indaver carries out Health and Safety Risk Assessments in order to identify health and safety risks at their sites and determine whether controls are required. These will be updated to incorporate the new facility.

The proposed facility will also implement an EMS which will outline the operational controls to be in place to prevent incidents as well as the required corrective and preventative actions.

In compliance with the Safety, Health and Welfare at Work Act 2005, Indaver will update the company safety statement covering the operation of the new facility and will appoint safety representatives.

15.2 Emergency Response Plan (ERP)

An ERP will be developed for the new facility which will be based on the tried and tested plan that is in place at Indaver's Meath facility. This will set out the requirements for emergency planning, training programmes, and emergency drill and exercise programmes.

The Emergency Response Team (ERT) will be on site during normal operating hours. Outside these hours the production team will, depending on the type of emergency, self-investigate or inform the emergency services. Procedures are in place for outside of hours emergencies. Procedures and staff are audited regularly.

15.3 Fire Management

The proposed facility has been designed and provided with adequate fire protection and detection systems.

Extensive fire detection measures will be installed across the site. These measures are based on tried and tested systems at Indaver's existing sites.

This will include infrared detectors in the waste bunker. In the event of a fire, an alarm will be activated in the control room. The fire-fighting system will include 4 no. water cannons in the waste bunker. All firewater, discharged from the canons, will be contained in the bunker.

The hopper and the furnace will be installed with infrared detectors and in the event of a fire, sprinklers over the hopper will turn on automatically.

The ram for feeding waste into the furnace will be equipped with a fire damper above it, which activates when the temperature exceeds a set level.

A 2,200m^3 storage tank will be provided for water to be used for firefighting. The tank and associated pump house will be located to the south of the main process building. The pump house will accommodate the fire-fighting water pumps and process water pumps.

15.4 Plant Shutdown

There are certain conditions that will trigger a plant shutdown. The sequence can be triggered automatically by the control system itself or by a plant operator. The sequence follows a set of logical steps to stop:

- Stop waste feeding,
- Bring on fuel oil burners to maintain minimum temperature of 850°C for as long as there is waste burning on the grate,
- Maintain flue gas cleaning systems and ID fan,
- Switch off burners,
- When flue gases have reached approximately 60°C in the stack, then the flue gas cleaning systems and ID fan can be switched off.

The same sequence is followed when bringing the plant to a stop for annual planned maintenance outages.

15.5 Site Closure and Liability

A Closure, Restoration and Aftercare Management Plan (CRAMP) and Environmental Liabilities Risk Assessment (ELRA) have been completed for the new facility and have been provided under section 9 of this application. These documents have been prepared in accordance with the Environmental Protection Agency's Guidance on Assessing and Costing Environmental Liabilities (2014).

16.0 ALTERNATIVES

The selected technology is proven and reliable and is very similar to the existing plant in Carranstown, Co. Meath. In the design of the facility, BAT for Waste Incineration were taken into account. Different combustion and flue gas cleaning technologies were considered based on the targeted waste streams for treatment, what is currently available in the market and technologies that have been proven at a similar scale to that proposed in this application.

As outlined in Chapter 3 of the EIAR, grate technology was chosen as grate furnaces treat residual waste safely and efficiently and are flexible enough to handle a wide range of waste types, thus responding to future changes in market conditions and waste streams. This technology has proven successful in the Meath Waste-to-Energy Facility that has been in operation since 2011.The Ringaskiddy Resource Recovery Centre will use Best Available Technology, will be economically viable, and will be in line with policy and planning. The grate furnace is robust and flexible enough to handle the diverse streams of household, commercial, industrial, non-hazardous and suitable hazardous waste that are characteristic of the Irish market.

17.0 SUMMARY OF EIAR MITIGATION MEASURES

A summary of the mitigation measures proposed as part of the EIAR for the development has been included in table 1 below. For each of the mitigation measures called out in the table, the relevant potential impact requiring mitigation has been stated.

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
Population & Human Health	Impact on human health	Given the nature of the proposed development, human health has primarily been assessed in terms of air quality and also noise.	The health and safety policy, procedures and work practices of the proposed development will conform to all relevant health and safety legislation both during the construction and operational stages of the proposed Resource Recovery Centre. The proposed development will be designed and constructed to best industry standards, with an emphasis being placed on the health and safety of employees, local residents and the community at large. The technology to be employed in the proposed development is well understood and has been used successfully in equivalent projects internationally, with no implications for health and safety. Many of the mitigation measures described elsewhere, such as in relation to emissions to air and noise, will have the effect of mitigating any effects on human health.
Population & Human Health	Psychological effects in relation to worry about human health effects	Concerns are likely in relation to public perceptions in relation to the health effects of the emissions of incinerators. This is likely to be added to by some catastrophisation which can happen in the media. It is also possible that some people opposed to incinerator the actually accentuate this. However, there are minimal adverse health effects attributable to modern well-run incinerator. The best mitigation factor would appear to be information and education. There is no evidence of ongoing psychological effects around incinerators published in literature and indeed no evidence in relation to the other Indaver facility in Carranstown, Co. Meath.	To minimise any potential psychological effects in relation to worry about human health effects, even though the overwhelming evidence is that there are none, ongoing information and education of the community will be made available. This may be facilitated by information and performance of the facility and emissions being available on a website for the public to review. Seeing the real values will likely reassure reasonable persons.
Population & Human Health	Nuisances	Nuisances as may result from air and noise emissions, changes to traffic arrangements, and changes to visual amenity.	To minimise the risk that the proposed development will cause nuisance, comprehensive mitigation measures will be implemented, during both the construction and operational phases of the development. These mitigation measures will reduce any significant negative impacts of the proposed development on the residential amenity of the local area.

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
			These mitigation measures are addresses under the relevant sections of air quality, noise, traffic, and landscape and visual below.
Roads and Traffic	Increased traffic volumes	Potential for impact on the Ringaskiddy Road network from increase traffic volumes generated from staff trips. However, the peak period of generated traffic from the proposed development do not correspond with the Ringaskiddy road network peaks. The greatest increase is on the link east of the Ferry Port Junction. In urbanised and industrialised areas, it is recognised that it is the capacity of the junctions on the road links rather than the road links themselves which determine the capacity of the road network. The following juctions were therefore assessed in the EIAR: • Junction 1 Shannon Park Roundabout; • Junction 2 Raffeen Bridge Junction; • Junction 3 Shanbally Roundabout; • Junction 4 Raffeen Road (adjacent to Shanbally Roundabout); • Junction 5 Barnahely Junction (N18/R613); • Junction 6 Ferry Port Access Junction; and • Junction 7 Proposed Indaver Entrance. The majority of these can accommodate the scheme and potential effects on the roundabouts have been addressed in the context of the traffic management scheme.	**Indaver Staff Mobility Management Plan** Indaver has prepared a Mobility Management Plan (MMP) for staff employed at the facility, which is intended to reduce the amount of single-occupancy car trips to and from the site. Note that for the purpose of this assessment, no reductions in single-occupancy car trips have been assumed to result from the implementation of the MMP. This MMP will be reviewed and revised on an annual basis. The review will comprise the undertaking of staff travel-to-work surveys and the review of targets set in the MMP. In the longer term, this MMP will remain part of company policy in order to ensure that the longer-term capacities of the existing N28 and upgraded M28 are still considered. **Staff Operational Hours** Indaver has structured staff working hours in order to ensure that arrivals and departures will occur outside of the AM and PM network peak periods. This will ensure that the traffic flows associated with staff movements at the site will occur during hours where there will be sufficient reserve capacity on the local road network to accommodate the projected increase in traffic.

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
Roads and Traffic	HGV Traffic Management	Potential for impact on the Ringaskiddy Road network. from HGV traffic flows associated with the facility during peak periods, and from HGV's queuing in and out of the facility.	**Indaver HGV Mobility Management Plan** The strategic development proposals submitted by the Port of Cork for an expansion of their facility at Ringaskiddy include a Freight Mobility Management Plan, developed to assist the Port in managing and controlling the flow of traffic to and from Ringaskiddy during peak hours. In a similar manner to systems already in use at its Meath facility, Indaver proposes to implement a mobility management plan for HGVs. This will include a dedicated waste planner who manages the SAP delivery booking system, control of gate operations at the site entrance, extended operating hours to allow customers to avoid the morning and evening peak periods on the local road network and a web-text service to disseminate information to customers. This will optimise the volume of waste delivery HGV traffic travelling to and from the site on the road network over the course of the whole day, allowing for traffic arrivals to be controlled and scheduled during peak periods. The above measures will allow Indaver to control the arrival and departure of HGVs in the 07:00-09:00 and 16:00-18:00 peak periods and reduce HGV trips to and from the RRRC during these times to a minimal level. The HGV mobility management plan covers all stages of delivery, from pre-arrival, through to arrival and presence onsite, and departure.
Air Quality	Emission Management	The Ringaskiddy Resource Recovery Centre facility has one main process emission point (flue). The relevant emissions will be NOx, SO2, CO, PM10 & PM2.5, TOC, HCl & HF, PCDD / PCDFs (Dioxins/Furans), PAHs, Hg, Cd and Tl, and the 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 the	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. In addition, the stack height has been designed in an iterative fashion in order to ensure that ambient ground level concentrations are minimised. 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. Thus, no specific additional mitigation measures are required during the operational phase of the facility.

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
		protection of human health for all parameters under maximum and abnormal operation of the facility. Thus, no adverse effect on public health or the environment, including the Cork Harbour SPA, is envisaged to occur at or beyond the facility boundary.	Monitoring of air emissions from the main stack will be undertaken on a scheduled basis. The specific monitoring requirements will be specified by the EPA in the Industrial Emissions licence which will be required prior to operations commencing onsite.
Climate	Greenhouse Gas Emissions	The proposed waste-to-energy facility would be expected to be the dominant source of CO2 and N2O emissions. Waste throughput information was obtained from Indaver and this information has been used to estimate GHG emissions from the facility. The annual waste throughput for the proposed grate incinerator will vary but will not be greater than 240,000 tonnes consisting of residual household, commercial and industrial waste.	During the treatment of waste at the facility, the thermal energy generated by the burning of waste will be recovered and will give an electrical output of about 21 MW with a net electrical output from the plant for export to the national grid of 18.5MW_e. Thus, the export of 18.5MW_e will give a direct benefit in terms of GHG emissions which would have been released in the production of 18.5MW_e from fossil-fuel burning power stations. The production of power for export to the National Grid reduces the impact of the site significantly. Residual emissions from the operational phase will be 0.097% of Ireland's likely national emissions total in 2020 and thus is not considered to be significant in the context of aggregated national emission sources and the benefits associated with energy recovery and displacement of electricity derived from fossil fuel sources. The Ringaskiddy Resource Recovery Centre will recover and recycle ferrous and non-ferrous materials during the thermal treatment process. The recycling of these metals will require less energy than processes using virgin inputs and thus lead to a direct saving in energy and thus GHG emissions. The operation of the facility will also allow the export of 172,000 tonnes of residual waste currently exported in the Southern Waste Region to continental Europe to cease leading to a saving of over 3,500 tonnes of $CO2_{eq}$ / annum.
Noise and Vibration	Potential for operational noise to impact on the nearest noise sensitive receptors	Once operational, it is anticipated that the facility will operate 24 hours per day, seven days per week and 365 days per year. However, waste acceptance will be limited to the hours 06.00 to 20.00 on week days and 09.00 to 14.00 on Saturdays.	**Fixed Installations and On-Site Vehicle Movements** Practicable noise control measures will be employed to ensure that noise from process and building services plant do not exceed the operational noise limits. In addition, the inclusion of acoustic attenuators to the aero condenser structure will be required to meet, as a minimum, the required insertion loss values set out in the EIAR.

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
		In terms of process and building services plant, the majority of equipment and processes will be internally housed within the on-site buildings which will significantly reduce the operational noise emissions to the surrounding environment. The primary potential noise sources associated with the waste-to-energy facility are associated with: • process and building services plant; • vehicle movements on site, and; • additional vehicles on public roads. There are no expected vibration sources associated with the operational phase.	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.] The proposed waste-to-energy facility has been assessed against the relevant operational noise emission limit values (ELV's) prescribed within the EPA's noise guidance document *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities* (NG4, EPA 2016) at the closest noise sensitive locations The assessment has concluded that due to the distance between the proposed development and the nearest sensitive buildings, the proposed site layout and the recommended noise mitigation measures, the facility can operate within the adopted day, evening and night-time noise limit values.
Landscape and Visual	Impact on Visual Amenity	The landscape and visual effects of the proposed development will generally be greatest from the north, south and east particularly within a 0.5km radius to the north and east (including Rocky Island), within areas of Cobh at White Point, from the Martello Park Road as it passes adjacent to the site (including the residential property to the northwest of the site), the National Maritime College car park, Gobby Beach and Ringaskiddy Martello tower. Landscape and visual effects will be predominantly direct in nature.	The most visible building will be the main process building and stack. Therefore, the form, height, positioning and cladding of this building has been carefully chosen to reflect the shape of the existing natural ridgeline, and to sit within it. The narrowest part of the building has been aligned to face and minimise visual effect on views from Ringaskiddy Martello tower. The varying heights of the roof are at minimum heights to house the internal machinery. The cladding materials have been chosen to reflect the existing shades and tones apparent in the area. Darker sections are proposed towards the bottom of the building and lighter sections towards the top, with angled sections of different tones to reflect the angle to the ridge depending on whether the viewer is viewing from the north, south, east or west and what the predominant backdrop from that direction will be. Many shapes, heights and colour ranges were tested using a 3D model and photomontages. The dark green and grey colour palette worked best against the sky and sea and the darker greys, greens, browns and black colours against the

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
			landform. The breaking down of the facades and roofline also helped to reduce the overall appearance of scale of the building. The other buildings including the administration, warehouse, electrical substation, aero-condenser, turbine and tanks will be of relatively small scale and will be placed behind the larger buildings or landscaped mounding where possible which will reduce their visual effect significantly. These buildings will be clad in a similar colour and material where they may be visible. Although closer to the road, due to the scale, these buildings will not be as visible as the larger main process building in longer range views. The landscape proposals and mitigation measures include ground remodelling to fit the larger process building into an excavated area of the slope to help reduce its height and visual mass. This involves retaining walls and reinforced grass slopes to the rear of the buildings around the service yards which will not be visible to the public. The landscape proposals also include screen mounding along the eastern and northern boundaries of the whole site. These will have an immediate screening effect, while vegetation alone will take a few years to establish.
Biodiversity	Effects on Marine Habitats	Potentially, effects on marine habitats could arise due to the deposition of the shingle above the foreshore on Gobby Beach.	Coastal protection works will take place outside the main wintering season for birds which runs from October to March. It is anticipated that monitoring of the coastal boundary and consequently the efficacy of the sacrificial material placed on the beach, will take place every year. If such material is to be replaced in the future, an ecological survey will be carried out in advance to ensure that ecological conditions have not changed in the intervening period.
Soils, Geology, Hydrology & Geology	Pollution of Soil and Water	Potential effects include the risk that soils and/or water could become polluted by accidental spillage of substances including fuels, oil, wastes	All substances that would have the potential to cause a negative impact on the soils and geology will be stored in appropriate containers and, if required, placed within bunded areas in the proposed development. All storage tanks for chemicals will be fully bunded or double skinned. Raw materials for the process will be stored in containers or silos within the process building. Residues will be stored in the bottom ash hall and silos within the process building. All waste entering the facility will be stored in fully contained structures. All

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
			waste storage facilities will be rendered impervious to the materials stored therein. All concrete underground storage structures whether for waste or liquid (as there is a possibility that firewater run-off may enter any of the tanks) will be constructed as watertight structures in accordance with the requirements of relevant Codes of practice such as EN 1992-3:2006 Eurocode 2 – Design of Concrete Structures – Part 3: Liquid retaining and containment structures. Typically, these structures will be reinforced concrete with minimum wall and base thicknesses of 250 mm or greater depending on the structural requirements. The construction of these tanks will comply with the requirements of the Eurocode. The structures will be integrity tested to confirm that they are watertight. This will be demonstrated to the satisfaction of the EPA following installation and prior to use for storage. Similarly, the storm water attenuation tank (which could also contain fire-water run-off) will be a watertight unit, which will be tested and demonstrated to be watertight to the satisfaction of the EPA. Roads, hard standings and yard areas will be paved to prevent any contamination of groundwater or soil. Storm water run-off from these areas will drain via hydrocarbon interceptors and will be collected in the storm water holding tank where it will be sampled to ensure that contaminated surface water will not be discharged from the site. The waste bunker will be constructed in accordance with the requirements of relevant Codes of practice such as EN 1992-3:2006 Eurocode 2 – Design of Concrete Structures – Part 3: Liquid retaining and containment structures. This will prevent any potential leakage of leachate from the waste to soil or groundwater. Tanker loading and unloading operations in the waste-to-energy facility will be undertaking in a dedicated tanker loading/unloading bay which will have a local collection system and holding tank to contain any spillage.

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
Soils, Geology, Hydrology & Geology	Contamination of soil or groundwater from contaminated firewater	Potential effects include the risk that soils and/or water could become polluted from rainwater run-off from fire-fighting in external areas, which could be contaminated.	Rainwater run-off from fire-fighting in external areas, which could be contaminated, will drain to the surface water drainage system and will be collected in the storm water holding tank. Run-off from fire-fighting in the bunker area will be collected in the bunker. Run-off from fire-fighting in other parts of the waste-to-energy building will be collected by the floor drains and held in the recovered water tank
Soils, Geology, Hydrology & Geology	Impact on the groundwater flow regime	Minor to negligible impact on the groundwater flow regime	Roads, hard standings and yard areas in the eastern part of the site will be paved. Surface water run-off from such areas and from the roofs of the buildings will be collected in the surface water drainage system. This will reduce the infiltration of surface water into the groundwater, in the eastern part of the site, and have a minor impact on the groundwater flow regime under this part of the site. The levels of the western field will be raised but the area will not be paved. This will allow the infiltration of surface water into the groundwater. There will be negligible impact on the groundwater flow regime under the western part of the site. Raising the road levels will have a negligible impact on the groundwater flow regime under the road. Similarly, the placing of sacrificial beach material will have a negligible impact on the groundwater flow regime of the beach.
Soils, Geology, Hydrology & Geology	Flood Risk	Extremely low risk of flooding	The levels of the low-lying parts of the site will be raised to 4.55mOD. This level will offer a very high standard of flood protection to the site. This measure will ensure that the risk of flooding to the site is very remote. The finished floor level of the buildings on the site will be set at even more conservative levels, all above 5mOD. It is proposed to upgrade the L2545 to address the risk of flooding of the road. The upgrade works will include raising a 185m section of the road to a maximum height of 3.45mOD between the car park adjacent to Gobby Beach and the eastern end of the Hammond Lane Metal Company site. This is approximately 1.0m above the existing road level. This will elevate the road to above the 200 year design tidal water level plus an allowance for climate change. This will offer a high level of protection to the road from tidal flooding and ensure that access and egress routes are maintained during extreme flood events. A new dedicated surface water drainage system will also be installed as part of the upgrade works to collect, convey and attenuate the runoff from the road

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
			before connecting back into the existing drainage to discharge to the foreshore. These measures are sufficient to ensure that the risk of flooding of the site and the L2545 is extremely low.
Soils, Geology, Hydrology & Geology	Coastal Recession	Coastal protection mitigation measures are not required for the waste-to-energy facility element of the development. Coastal protection measures have been added precautionary measure so as to reduce the rate of erosion of the glacial till face.	The proposed placement of sacrificial beach nourishment material will mitigate the potential landslide hazard, which is primarily confined to the shoreline at the site. Earth/rock retaining structures will be constructed in the eastern part of the site as required to ensure the continued stability of this part of the site. The coastal protection works will reduce the rate of erosion of the glacial till slope along the site's boundary.
Material Assets	Water Conservation	Water supply will be via an existing water main on the L2545 road adjacent to site. it is expected the operation of the proposed facility will require 5.4m^3/hr of water and there is sufficient capacity in the mains. It is not anticipated that the development will have a significant effect on water supply.	An air-cooled condenser will be used to cool the steam from the turbine, and air cooling will be used in the transformers. This will minimise the quantity of potable water that will be required.
Material Assets	Positive effect on material assets in terms of power generation.	The waste-to-energy facility will generate 21MW of electrical energy produced by the combustion of the waste, of which 2.5MW will be used by the facility itself with the remainder, approximately 18.5 MW being exported to the national grid. The electricity produced by the waste-to-energy facility will be enough to supply the power needs of approximately 30,000 households. Therefore, the proposed facility will have a significantly positive effect on material assets in terms of power generation.	During operation, energy efficient power systems will be employed, water conservation measures will be implemented, and wastes will be avoided, minimised or recycled where economically feasible.
Material Assets	Waste Management	The effect of exporting of surplus material off-site will depend on the disposal option or combination of options available to the contractor at the time.	Wastes arising on site, for example from the administration building and maintenance activities, will be sent off site to be recycled where practical, and treated in the Waste-to-Energy facility if not. A beneficial reuse will be sought for the bottom ash. Metals will be recovered from the bottom ash.

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
Major Accidents & Disasters	Risk of major accident/disaster	There were no scenarios found to present a 'priority' level of risk. There was one scenario identified as presenting a 'substantial' level of risk, which was a scenario involving a fire in the bunker area.	The scenario involving a fire at the bunker was identified as presenting the highest risk rating of the scenarios examined in the HAZID&RA. The following risk reduction and risk mitigation measures will be put in place to protect against this scenario. All process activities at the site, including receipt and handling of materials at the bunker, will be carried out by trained operators. Indaver will develop standard operating procedures (SOPs) to governing how these activities are carried out. Indaver will conduct a visual inspection of waste as it is unloaded at the bunker. This inspection will be carried out by a trained operator. For new customers, loads will be emptied out in the tipping hall area and examined in more detail prior to admittance to the bunker. A fire damper will be fitted, which will close in the event of a fire initiating at the bunker. This measure will ensure that there will be no air supply to the boiler from the bunker area under these circumstances. The bunker will be a concrete structure and will be compartmentalised (1-hour fire rating). This measure will help to mitigate against the risk of this scenario by limiting the rate at which a fire can develop in this area. Fire wrapping will be installed on cables at the bunker, to ensure continued function in the event of a fire developing. Indaver will operate a hot work permitting system at the site, to control ignition sources. Where practicable, when maintenance works are required, equipment will be taken outside of the bunker for these works. The nature of the activity carried out at the site means that there is a quick throughput of material at the bunker. This means that waste is not left to settle within the bunker for a long period of time (4-5 days). Indaver will also implement a Bunker Management Programme. This will be

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
			carried out once or twice per year, prior to shutdown periods. Indaver will empty out the bunker to bring the inventory to low level (as far as practicable). This, in conjunction with the quick turnaround of material in the bunker (4- 5 days), will help to avoid a situation where a waste batch is allowed to sit in the bunker for a long period of time. Indaver will install UV/IR detectors in the bunker and at the hopper. These detectors will enable early detection in the event of smouldering waste in the bunker. If practicable and safe to do so, Indaver can load this waste directly to the hopper and then add more waste on top to smother it. This is done at other sites in accordance with a documented procedure and this same procedure will be implemented at Ringaskiddy. A dedicated deluge system will be installed above the hopper. At the time of the HAZID&RA review it was noted that Indaver had implemented a monitoring programme at another of their sites, to study the potential for methane formation due to anaerobic digestion of waste in the bunker at that site. This study has since been completed and has found that the methane levels are very low during operations and rise to levels of up to 400 ppm during shutdowns, when there is no primary air extraction at the bunker. This concentration does not present a fire hazard. Indaver will install LEL detectors at the bunker at the Ringaskiddy site, so that similar monitoring can be carried out there also. Indaver will install 4 no. fixed water cannons at the bunker, which will provide the facility to douse spot fires. This measure will allow Indaver to respond to a developing fire scenario, allowing the operator the facility to extinguish the event before it becomes fully developed. This allows the fire to be extinguished rapidly and with relatively low volumes of water when compared with a fully developed fire. Indaver will also install a closed dry head sprinkler system in the bunker, as back up to the water cannons. The sprinkler system will be designed to extinguish a fully developed fire. As such, even in the worst case fire scenario the policy is one of extinguishment and not one of controlled burn down.

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
			A 250 mm high stop block or kerb will be installed at the bunker to protect against the risk of a trailer falling into the bunker when unloading waste. The bunker will be designed to act as fire water retention facility, to prevent the risk of fire-fighting water that is applied at the bunker subsequently escaping off site as contaminated run-off.
Major Accidents & Disasters	Risk of loss of containment events	Loss of containment of materials in tanks or IBCs resulting in pollution of the receiving environment	**Containment Area Safety Management** Design of tanks incorporating measures to protect against siphoning of the tank contents (e.g. a hole in pipeline at top point on tank outlet or a check valve) in the event of line failure. Impact protection on storage tanks. Double skinned tanks, with leak detection between skins to detect a leak in the primary containment layer (fuel oil, ammonia). Deliveries to the tanks are manned activities carried out by trained operators. Transfer hoses are inspected by trained operators prior to delivery being made. Visual inspection of tankers prior to acceptance on site. Overfill protection system on storage tanks (level gauging, level switches). Personal protective equipment (PPE) for operators involved in carrying out deliveries, where required. Contents of aqueous waste tank are diluted (>70% water), thereby reducing the fire hazard. UN approved containers / packaging for materials; caged IBCs to protect against loss of containment of aqueous HCl due to impact. Bunded IBCs to retain a spill from the primary containment. Investigations / follow up if supplier provides faulty or damaged IBC.

Environmental Factor	Likely Effects Identified	Brief Description of Effect	Mitigation Measures Proposed to Control Effect
Major Accidents & Disasters	General Safety	Potential impacts to human safety resulting from the operation of the facility	Measures have been devised based on the Operator's experience in similar facilities in Europe. All operators will be trained in the tasks they must carry out, with periodic refresher training as required. Documented SOPs for carrying out activities on site. Trained fitters for carrying out maintenance works. Regular site inspection. Formalised preventative maintenance program on site (SAP). Lock out, tag out procedure when carrying out maintenance works on plant. Permit to work sign off by authorised party. Vessels, piping designed to recognised standard/specification. Indaver personnel conduct screening / assessing of deliveries to site. Speed limit / traffic management controls. Oil water separator on drains. ATEX zoning. Control of ignition sources on site. Fire-fighting system - hoses, extinguishers, water cannons. Spill kits. Emergency response team.

Table 1. Summary of Mitigation Measures from the EIAR