18 Summary of Effects and Mitigation Measures

18.1 Introduction

It has been the intention of Indaver to reduce the adverse effects of the proposed development on the environment to a practical minimum. Where unavoidable environmental effects have been identified during the environmental impact assessment process, measures have been proposed to mitigate these effects as much as reasonably possible.

This chapter summarises the likely residual environmental effects associated with the proposed development. The predicted effects and recommended mitigation and monitoring measures are comprehensively detailed in the relevant chapters of the EIAR and are summarised in the various sections below.

18.2 Construction Phase

18.2.1 Population and Human Health

18.2.1.1 Mitigation and Monitoring Measures

Refer to Section 18.3.1.1 below

18.2.1.2 Residual Effects

Refer to Section 18.3.1.2 below

18.2.2 Roads and Traffic

18.2.2.1 Mitigation and Monitoring Measures

Construction Traffic Management Plan

Indaver will appoint a construction management team for the duration of the construction phase. The team will supervise the construction of the project, including monitoring the performance of the contractors to ensure that all of the proposed construction phase mitigation measures are implemented and that construction effects and nuisance are minimised. Indaver will liaise with neighbours and the general community during the construction phase to ensure that any disturbance is kept to a minimum.

A number of significant construction management measures have already been committed and factored into this assessment, including the scheduling of construction activities outside peak periods in order to ensure that the capacity of the N28 corridor is maintained at peak periods. As outlined in this assessment, construction staff and vehicles will not be present on the local road network from 07:00-09:00 and from 16:00-18:00.

These commitments will establish the principles that will inform the full development of a Construction Traffic Management Plan, which will be prepared by the appointed main contractor prior to construction commencing. The Construction Traffic Management Plan will comprise all of the construction traffic mitigation measures which are set out in this EIAR and any additional measures which are required by the conditions attached to the Board's decision. The Construction Traffic Management Plan will also include any specific requirements of Cork County Council during the construction phase including any monitoring and reporting requirements. This Plan will be submitted to and agreed with Cork County Council prior to construction commencement. An indicative outline of the structure and content of the CTMP is outlined in **Appendix 5.1**.

There are no specific monitoring measures proposed during the construction stage of the scheme.

18.2.2.2 Residual Effects

Refer to Section 18.3.2.2 below.

18.2.3 Air Quality

In order to sufficiently ameliorate any potential negative effects on the air environment, a schedule of measures has been formulated for both construction and operational phases associated with the proposed facility.

18.2.3.1 Mitigation and Monitoring Measures

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for effect from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of dust produced will be deposited close to the generated source. A series of measures, based on best practice[6], have been formulated (see below) for the construction phase of the project, as construction activities are likely to generate some dust emissions.

In order to ensure that no dust nuisance occurs, the following dust control measures will be implemented.

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic only apart from the contractor's car park which will be hardcore only.
- Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20 km/h, and on hard surfaced roads as site management dictates.
- Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.

- Wheel washing facilities will be provided for vehicle exiting site in order to ensure that mud and other wastes are not tracked onto public roads.
- Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.

During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed by the Site Environmental Manager (SEM) as outlined in the Construction Environmental Management Plan (CEMP) in **Appendix 5.1** of this EIAR. Boundary monitoring of dust emissions will be undertaken using Bergerhoff dust gauges at a number of locations near sensitive receptors with results compared to the TA Luft dust deposition level of 350 mg/(m^2*day) as an annual average. In the event of significant dust deposition occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

18.2.3.2 Residual Effects

During the construction phase of the project there may be some effect on nearby properties due to dust emissions from the construction site and other activities. Air emissions may also result from idling construction vehicles and the use of mobile generators. However, due to the formulation of an effective dust and air quality minimisation plan, it is considered that the residual effect will be slight.

18.2.4 Climate

18.2.4.1 Mitigation and Monitoring Measures

There will be no significant impact on climate during the construction phase of the project. Therefore, no mitigation measures are proposed with respect to climate.

18.2.4.2 Residual Effects

There will be no significant residual impacts on climate.

18.2.5 Noise and Vibration

In order to sufficiently ameliorate potential noise and vibration effects, a schedule of noise and vibration control measures has been formulated for both construction and operational phases, where required.

18.2.5.1 Mitigation and Monitoring Measures

The construction phase appraisal has indicated that, during the various key activities proposed as part of this development, construction activities can be undertaken within the proposed noise criteria at the nearest sensitive buildings. During out–of-hours construction periods, or other construction scenarios with high potential for noise and vibration generating activities best practice noise and vibration control measures will be employed by the contractor in order to avoid significant effects at the nearest sensitive buildings.

The best practice measures set out in BS 5228 (2009 +A1 2014) Parts 1 and 2 will be complied with. This includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- selection of quiet plant;
- noise control at source;
- screening;
- liaison with the public, and;
- monitoring.

Details in relation to these mitigation measures is set out in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise and vibration monitoring.

As discussed in **Section 5.11** of **Chapter 5** ***Construction Activities***, a construction environmental management plan (CEMP) has been prepared prior to construction commencing, refer to **Appendix 5.1**. The Site Environmental Manager (SEM), appointed by the Contractor, will be responsible for the successful development, implementation and maintenance of the CEMP, will carry out environmental inspections.

Selection of Quiet Plant

This practice will relate to static plant, such as compressors and generators. Units will be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

Noise Control at Source

If required, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and or maintaining

enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant will be switched off when not in use and not left idling.

- For piling plant, noise reduction will be achieved by enclosing the driving system in an acoustic shroud, where necessary. For steady continuous noise, such as that generated by diesel engines, it is possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover.
- For percussive tools such as pneumatic concrete breakers, rock drills and tools a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensure any leaks in the air lines are sealed. Further reductions in noise levels will be achieved by erecting localised screens around breakers or drill bits when in operation in close proximity to noise sensitive boundaries.
- For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling, materials will not be dropped from excessive heights. Drops chutes and dump trucks will be lined with resilient materials.
- For compressors, generators and pumps, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation, where required.
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. It has been assumed for the purposes of this assessment that a standard construction site hoarding will be erected around the site boundaries of the main building works of the waste to energy building. The site hoarding will be constructed of a material with a mass per unit of surface area greater than 7 kg/m2 to provide adequate sound insulation.

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

Liaison with the Public

The Site Environmental Manager (SEM) will be the designated officer appointed to site during construction works as described in the CEMP (Appendix 5.1). Any noise complaints should be logged and followed up in a prompt fashion by the SEM. In addition, as part of the communication strategy for the project, prior to particularly noisy construction activity or those with potential for perceptible vibration levels, e.g. rock breaking, piling, etc., the SEM will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

Monitoring

Prior to the construction works commencing on site, environmental noise and vibration monitors will be installed at the selected monitoring locations. The SEM will be responsible for this monitoring.

Noise monitoring will be conducted in accordance with the International Standard ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise. Vibration monitoring will be conducted in accordance with BS 4866 (2010) Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures.

Project Programme

The construction programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. If piling or rock breaking works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance.

18.2.5.2 Residual Effects

During the construction phase of the project, there will be a slight to moderate short-term effect on nearby noise sensitive properties due to noise emissions from construction works and site traffic. Due to the distance between the construction works and the nearest sensitive receptors, however, the calculated noise effects are within the relevant criterion set for this phase.

Construction works will take place outside of normal working hours for up to 8 weeks. During these working hours, construction noise will be limited to the criteria set within **Section 10.5.2.1** to avoid any significant effects to the surrounding environment. The implementation of appropriate noise control measures will ensure that noise effect is kept within the recommended criteria.

The application of binding noise limits, monitoring, and controlled working hours, along with implementation of appropriate noise and vibration mitigation measures as set out above, will ensure that noise and vibration effect is sufficiently controlled to within the relevant criteria. The overall noise effect during the construction of the proposed facility at the nearest noise sensitive properties is short term, minor to moderate. Vibration effects during this phase are determined to be temporary and not significant.

Noise levels associated with of the Resource Recovery Centre for the worst-case construction scenarios assessed are calculated to be less than 35dB L_{Aeq} at the closest areas of the Cork Harbour SPA to the south of the development site. This particular area of the SPA is located in close proximity to a number of existing industrial facilities (i.e. GSK, De Puy and Hovione) with operational noise limits of 55dB L_{Aeq} during daytime periods and 45dB L_{Aeq} during night-time periods. Given that predicted construction noise levels at this location are significantly below the permitted operational noise levels from adjacent facilities, the noise effect from construction activities at the closest area of the SPA are short-term, imperceptible.

All other areas of the Cork Harbour SPA are located at distances beyond 1.5km from the proposed site with lower construction noise levels predicted at these

distances, (less than 30dB L_{Aeq}) which is well below typical baseline noise levels in the surrounding environment. Taking the above into consideration, the construction phase of the Resource Recovery Centre is determined to have no significant effect to the existing noise environment at any parts of the designated Cork Harbour SPA. The overall effect is neutral, short-term, imperceptible.

18.2.6 Landscape and Visual

Refer to Chapter 11 (Landscape and Visual) for detailed analysis, in particular Table 11.2 in relation to the significance of landscape and visual effect during construction and operational phases. Refer also to Section 18.3.6 below for further details.

18.2.6.1 Mitigation and Monitoring Measures

Refer to Section 18.3.6.1 below for further details.

18.2.6.2 Residual Effects

Refer to Section 18.3.6.2 below for further details.

18.2.7 Biodiversity

18.2.7.1 Mitigation and Monitoring Measures

A construction environmental management plan (CEMP) has been prepared and is included in **Appendix 5.1** of this EIAR. The CEMP contains all of the construction mitigation measures, which are set out in this EIAR and NIS, and any additional measures which are required by the conditions attached to the Board's decision. The principal measures which will be set out in the CEMP are summarised below:

Protection of habitats

To prevent incidental damage by machinery or by the deposition of spoil during the site clearance stage, any trees /habitats earmarked for retention will be securely fenced early in the construction phase. The fencing will be clearly visible to machine operators.

To prevent Japanese Knotweed from outside the site being inadvertently being brought in to the site, the contractor will be required to inspect vehicles before using them on site and will pay particular attention to caterpillar tracks and where trucks and dumpers are stowed. The supplier of fill will be required to provide a guarantee that the fill to be imported does not contain knotweed. In addition, the fill will be inspected for signs of knotweed, prior to importation to site.

Habitat creation/restoration

It is proposed therefore to enhance the habitat value of an area of improved grassland in the southwest corner of the site, which is approximately 3ha in size. This will be achieved by introducing specialist grass seed mixes based on the naturally occurring plant species found in this area, the introduction of species

such as the parasitic yellow rattle and of key species such as knapweed that are important attractors for butterflies and other invertebrates.

The species mix will include species found within the site and locality and will take into account prevailing ground conditions and the coastal environment. A specific, long-term management programme that includes a grazing and/or cutting regime to maintain diversity within the sward will be implemented. Fertiliser applications have been discontinued. The long-term aim will be the establishment of a species rich grassland (i.e. a combination of Dry Meadow and Grassy Verge GS2, Wet Grassland GS4 and Neutral Grassland GS1). It is noted that the creation of a sustainable diverse grassland on high fertility grassland is a long-term process which requires specialist expertise.

It is noted that scrub will be retained within the site to the south west of the Hammond Lane site. Areas of dense bracken within this area will be treated to reduce the dominance of bracken which tends to suppress ground flora. This will also serve to increase biodiversity within the remaining areas of semi-natural habitat which will be retained within the site boundary.

Protection of water quality

A dedicated holding tank for storage of construction foul effluent will be constructed prior to commencement of the main construction activities. The effluent will be regularly disposed of off-site by tanker by a licensed contractor to an approved licensed facility

Storm water will be managed carefully during construction. In general, storm water will be infiltrated to ground via silt traps and managed soakaways. The laydown areas will be suitably drained and any areas which will involve the storage of fuel and refuelling will be paved and bunded and hydrocarbon interceptors will be installed to ensure that no spillages will get into the surface water or groundwater.

The employment of good construction management practices will minimise the risk of pollution of soil, storm water run-off, seawater or groundwater. The Construction Industry Research and Information Association (CIR*IA) in the UK has issued a guidance note on the control and management of water pollution f*rom construction sites, *Control of Water Pollution from Construction Sites, guidance for consultants and contractors (Masters-Williams et al 2001). Additional g*uidance is *prov*ided in the CIRIA technical guidance on *Control of Water Pollution from Linear Construction Projects* (Murnane *et al* 2006). Construction mitigation measures are further outlined in **Section 5.8** of this EIAR.

Measures, as recommended in the guidance above, that will be implemented to minimise the risk of spills and contamination of soils and waters, include:

- Training of site managers, foremen and workforce, including all subcontractors, in pollution risks and preventative measures.
- Careful consideration will be given to the location of any fuel storage facilities. These will be designed in accordance with guidelines produced by CIRIA and will be fully bunded.
- vehicles and plant will be regularly inspected for fuel, oil and hydraulic fluid leaks. Suitable equipment to deal with spills will be maintained on site.

- Where feasible, soil excavation will be completed during dry periods and undertaken with excavators and dump trucks. Topsoil and subsoil will not be mixed together. Specific measures will be implemented, as specified by the Construction Environmental Management Plan to ensure that Japanese Knotweed is not spread within the site or outside the site boundaries.
- Ensure that all areas where liquids are stored, or cleaning is carried out are in a designated impermeable area that is isolated from the surrounding area, e.g. by a roll-over bund, raised kerb, ramps or stepped access.
- Use collection systems to prevent any contaminated drainage entering surface water drains, watercourses or groundwater, or draining onto the land.
- Minimise the use of cleaning chemicals.
- Use trigger-operated spray guns, with automatic water-supply cut-off.
- Use settlement lagoons or suitable absorbent material such as flocculent to remove suspended solids such as mud and silt.
- Ensure that all staff are trained and follow vehicle cleaning procedures. Post details of the procedures in the work area for easy reference.

Air quality

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for effect from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of dust produced will be deposited close to the generated source. A series of measures, based on best practice, have been formulated (see below and also **Section 8.6.1.1** of **Chapter 8 *Air Quality*)** for the construction phase of the project, as construction activities are likely to generate some dust emissions:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic only apart from the contractor's car park which will be hardcore only.
- Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20 km/h, and on hard surfaced roads as site management dictates.
- Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.
- Wheel washing facilities will be provided for vehicle exiting site in order to ensure that mud and other wastes are not tracked onto public roads.
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary.

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting, or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
- Dust monitoring will also be carried out during the construction phase (Refer to **Chapter 8** for further details).

Waste management

Waste generated during the construction phase will be carefully managed according to the accepted waste hierarchy which gives precedence to prevention, minimisation, reuse and recycling over disposal with energy recovery and finally disposal to landfill. Further details are provided in the CEMP included as **Appendix 5.1** to this EIAR under **Section 7**, ***Construction Waste Management***.

18.2.7.2 Residual Effects

Refer to Section 18.3.7.2 below.

18.2.8 Soils Geology Hydrology and Hydrogeology

Mitigation measures to prevent effects on soils and geology, hydrology and hydrogeology during the construction phase are described below

18.2.8.1 Mitigation and Monitoring Measures

Soils and Geology

Excavated material will be reused onsite where feasible. As discussed in **Section 13.4.2.1** of Chapter 13, the clean and inert surplus excavated material, which is integral to the construction phase, may be reused as a by-product on other sites subject to Article 27 under the Waste Directive Regulations 2011 and notification to the EPA. Where a re-use for the material cannot be found or where the material is not suitable for re-use, the material may be sent to suitably permitted waste facilities or licenced soil recovery facilities in accordance with relevant waste legislation or disposed at suitable authorised waste facilities.

Excavated soil materials will be stockpiled appropriately to minimise the effects of weathering and soil compaction. Care will be undertaken in re-working this material to minimise dust generation, groundwater infiltration, and generation of run-off.

Earthworks operations will be carried out such that surfaces shall be designed with adequate falls, profiling and drainage to promote safe run-off and prevent ponding and flooding. Run-off will be controlled through erosion and sediments control structures appropriate to minimise the silt in the run-off. Care will be taken to ensure that the bank surfaces are stable to minimise erosion.

There are no watercourses on site. Cork Harbour lies adjacent to the eastern boundary of the site. The employment of good construction management

practices will minimise the risk of pollution of soil, storm water run-off, seawater or groundwater and any deterioration in the quality or quantity of surface or groundwater.

In general, storm water will be infiltrated to ground via managed soakaways. The laydown areas will be suitably drained and any areas which will involve the storage of fuel and refuelling will have paved areas with bunding and hydrocarbon interceptors to ensure that no spillages will get into the surface water or groundwater systems.

The Construction Industry Research and Information Association (CIRIA) in the UK has issued a guidance note on the control and management of water pollution from construction sites, *Control of Water Pollution from Construction Sites, guidance for consultants and contractors* (Masters-Williams et al 2001). Additional guidance is provided in the CIRIA technical guidance on *Control of Water Pollution from Linear Construction Projects* (Murnane *et al* 2006).

The guides are written for project promoters, design engineers and site and construction managers.

They address the main causes of pollution of soil, groundwater and surface waters from construction sites and describes the protection measures required to prevent pollution of groundwater and surface waters and the emergency response procedures to be put in place so that any pollution, which occurs, can be remedied. The guides address developments on green field and potentially contaminated brownfield sites. The construction management of the site will take account of the recommendations of the CIRIA guidance to minimise as far as possible the risk of soil, groundwater and surface water contamination.

Site activities considered in the guidance include the following:

- Excavation;
- Earthmoving;
- Concreting operations;
- Spreading of topsoil;
- Road surfacing;
- Site drainage, and the control and discharge of surface water runoff from the site;
- Oil and fuel delivery and storage; and
- Plant maintenance.

Measures, as recommended in the guidance above, that will be implemented to minimise the risk of spills and contamination of soils and waters, include:

- Training of site managers, foremen and workforce, including all subcontractors, in pollution risks and preventative measures.
- Careful consideration will be given to the location of any fuel storage facilities. These will be designed in accordance with guidelines produced by CIRIA, and will be fully bunded.
- All vehicles and plant will be regularly inspected for fuel, oil and hydraulic fluid leaks. Suitable equipment to deal with spills will be maintained on site.

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

Best practice, in accordance with relevant codes of practice and guidelines, will be followed to minimise the risk of spreading Japanese knotweed on or off the site (**Section 5.11.4**, of this EIAR) during the construction phase.

It is expected that the EPA will impose a condition, in the industrial emissions licence, requiring the monitoring of soil on site at regular intervals.

The proposed placement of sacrificial material on the beach will be undertaken above the foreshore on Gobby Beach. Clean material will be used and there is not expected to be a significant impact on water quality. Refuelling of equipment will not be allowed on the beach.

The implementation of the above measures will ensure that the risk of pollution of groundwater, soils and surface waters, resulting from the construction activities will be minimised.

Landslide Risk

The proposed placement of sacrificial beach nourishment material will mitigate the potential landslide hazard, which is primarily confined to the shore line at the site. The construction process will not pose a risk of landslides to the shore line cliffs.

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.

Hydrogeology

Groundwater pollution will be minimised by the implementation of good construction practices. The measures, described above to prevent a negative impact on soils and geology during the construction stage will also prevent a negative impact on hydrogeology.

Hydrology

Mitigation measures to prevent impact on hydrology during the construction phase are described above. The measures described above, to prevent a

negative impact on soils and geology during the construction stage will also prevent a negative impact on hydrology.

Coastal Recession

Access to the recreational amenity of Gobby Beach shoreline and nearby car park will be a temporarily impacted (for approximately 3 weeks) during the placement of sacrificial beach material. The sacrificial material consists of imported shingle which will be temporarily deposited on the car park. To ensure the safety of the general public, it is envisaged that the area of the beach, in which the construction works will taking place and the area of the car park in which the materials will be stored, and which will be used by the machinery, will be closed to the public for the duration of the proposed works. However, access to other sections of the beach will be maintained for the duration of the works.

It is noted that the construction effects experienced during the placement of the shingle will be repeated when the shingle is reapplied in the future. The same mitigation measures as described above will be applied for repeat applications.

The stone on Gobby Beach is a mix of the stone, arising from stone embedded in the glacial till cliffs. There are a number of sand and gravel quarries located in the glacio-fluvial gravel channel extending from west of Classes, to the west of Cork City, to east of Midleton. Material from any of the gravel quarries will be a suitable source for the beach sacrificial material.

18.2.8.2 Residual Effects

Refer to Section 18.3.8.2 below

18.2.9 Architectural, Archaeological and Cultural Heritage

18.2.9.1 Mitigation and Monitoring Measures

The construction phase of the proposed development will involve ground disturbance that would affect any potential archaeological material that may survive below the ground surface. The ground disturbance will be confined to Areas 1 and 2 i.e. the eastern end of the site and the western fields along the northern boundary and part of Area 3 where the amenity walkway will be located along the southern boundary. In Areas 1 and 2 the ground disturbance will involve ground reduction. In Area 3 along the route of the amenity walkway the path will be built on a no-dig basis. As ground reduction works are not proposed for Areas 3 or Area 4 subsurface archaeological material will not be disturbed and no archaeological mitigation is proposed. These areas, excluding the route of the amenity walkway, will be fenced off during the construction process and no construction works will be undertaken within them.

The National Monuments Service assesses the archaeological requirements for each proposed development on a case by case basis generally following a review of the archaeological assessment. The requirement for geophysical survey, archaeological testing and other mitigations are outlined. In this case it is anticipated that a programme of archaeological investigations in advance of construction will be required. This may include geophysical survey and archaeological testing of areas which will be affected by the development.

Notwithstanding additional requirements of the National Monuments Service Indaver propose to undertake a programme of archaeological investigations in agreement with the National Monuments Service, the National Museum of Ireland and the Local Authority on Areas 1 and 2 in advance of development. A programme of geophysical survey will be undertaken in Area 1. The current ground conditions in Area 2 make this ground unsuitable for geophysical survey. A programme of licensed archaeological testing will follow the geophysical survey and will extend across Area 2, in consultation with the above bodies. The testing will target potential archaeological anomalies highlighted by the geophysical survey in Area 1 and will comprehensively investigate Area 2. Archaeological testing will be carried out in the area of the path from Gobby Beach, shown on the 1st 2nd and 3rd editions of the OS maps, in an attempt to identify its nature and extent. Any archaeological features identified during the programme of archaeological investigations, including the line of the path will be fully resolved to professional standards of archaeological practice. Such material will be preserved *in situ* or preserved by record, as appropriate, as outlined in Policy and Guidelines on Archaeological Excavation – Department of Arts, Heritage, Gaeltacht and the Islands.

The upgrading of the L2545 road will be within the footprint of the existing road and no archaeological mitigation is proposed.

An intertidal and metal detector survey of the foreshore at Gobby Beach was undertaken in May 2015 by the author. The survey extended along the base of the glacial till slope which forms the eastern site boundary. One item of archaeological significance, a small cannon ball measuring 62mm diameter, was found during the metal detector survey. No features of archaeological potential were noted, and no other archaeological objects were found. No archaeological features or finds were visible in the glacial till face at the west of the beach. It is possible that previously unrecorded sub-surface archaeological features may exist along the foreshore and may be disturbed by the traversing of the strand by plant and machines during the proposed coastal protection works. To minimise the effect on the beach, a single access route to the working area at the base of the glacial till slope will be established and fenced off for the duration of the proposed works. This will be archaeologically monitored during the works. Any archaeological features identified during the work will be fully resolved to professional standards of archaeological practise. Such material will be preserved *in situ* or preserved by record, as appropriate.

Archaeological monitoring of the groundworks within the Lough Beg substation will be undertaken to facilitate the electrical connection to and from the site.

Monitoring of vibrations will be undertaken at Ringaskiddy Martello tower during the construction process.

18.2.9.2 Residual Effects

Refer to Section 18.3.9.2 below

18.2.10 Material Assets

18.2.10.1 Mitigation and Monitoring Measures

The proposed Ringaskiddy Resource Recovery Centre will be constructed and operated in accordance with good practice in energy and resource conservation, and efficiency.

A construction environmental management plan (CEMP) has been prepared, refer to **Appendix 5.1** and summarises the overall environmental management strategy that will be adopted and implemented during the construction phase including the responsible and efficient management of material assets including water and waste. Under the CEMP, the contractor will appoint a Construction Waste Co-Ordinator who will be responsible for implementing the construction waste management plan (CWMP). Refer to **Section 7** of **Appendix 5.1** of this EIAR for details of the CWMP.

18.2.10.2 Residual Effects

No significant residual effects are predicted. Refer also to Section 18.3.10.2 below

18.2.11 Major Accidents and Disasters

18.2.11.1 Mitigation and Monitoring Measures

As noted in **Section** Error! Reference source not found., none of the hazards identified in this report arise during the construction phase of the development. However, a Construction and Environmental Management Plan (CEMP) will be in place to ensure that the construction is carried out in a safe manner with regard to safeguarding the environment from potential incidents on site. The CEMP also sets out the Construction Traffic Management Plan which will be finalised and implemented by the Contractor. The CEMP is described in **Appendix 5.1** of **Chapter 5** ***Construction Activities***.

Risk assessment is an integral part of the CEMP. Furthermore, the PSCS (Project Supervisor Construction Stage) will ensure that the interaction of different activities at the site is managed safely so as not to present any unacceptable risks. The CEMP will also incorporate the development of an Incident Response Plan (IRP) to ensure that, in the unlikely event of an incident, response efforts are prompt, efficient, and appropriate. The objectives of the IRP will be to:

- Ensure the health and safety of workers and visitors along the site.
- Minimise any impacts to the environment and ensure protection of the water quality and the aquatic species dependent on it.
- Minimise any impacts on properties, services etc.
- Establish procedures that enable personnel to respond to incidents with an integrated multi-departmental effort and in a manner that minimises the

possibility of loss and reduces the potential for affecting health, property, and the environment.

- The CEMP also sets out provisions for traffic management during the carrying out of the construction works.

Monitoring

The CEMP will include provision for continuous inspections, auditing and monitoring of the construction works. The Site Environmental Manager (SEM) will draw up a schedule of monitoring, which will set out roles and responsibilities for monitoring and reporting the works. In the event that the monitoring results indicate that the works are not being carried out in accordance with the contractual requirements, the SEM is responsible for initiating and reporting on the corrective actions to be implemented.

The SEM and the Construction Manager will also carry out quarterly audits to ensure that the Contractor engaged in carrying out the works is successfully meeting all environmental commitments / requirements under the CEMP.

The effective implementation of the CEMP will help to reduce the risks associated with the construction phase of the project in terms of the environmental effects. The PSCS (Project Supervisor Construction Stage) will monitor performance against the CEMP to ensure that it is adhered to throughout the process.

18.2.11.2 Residual Effects

There are no major accident hazard implications during the construction phase of the proposed development. The accident scenarios discussed in this chapter of the EIAR mainly relate to hazards associated with the storage and handling of dangerous substances or the storage and handling of waste at the site. As such, these hazards will not arise until after the construction phase has been completed and the operational phase has commenced (see **Section** Error! Reference source not found.).

18.2.12 Cumulative Effects

18.2.12.1 Mitigation and Monitoring Measures

No specific mitigation or monitoring measures proposed for cumulative effects. Refer to other sections of the EIAR.

18.2.12.2 Residual Effects

No significant residual effects predicted.

18.3 Operational Phase

18.3.1 Population and Human Health

18.3.1.1 Mitigation and Monitoring Measures

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

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

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

Chapter ***5 Construction Activities*****, Chapter 7** ***Roads and Traffic*****,**

Chapter 8 ***Air Quality*****, Chapter 9** ***Climate*****, Chapter 10** ***Noise and Vibration*****,**

Chapter 11 ***Landscape and Visual*****, Chapter 12** ***Biodiversity*****,**

Chapter 13 ***Soils, Geology, Hydrogeology, Hydrology & Coastal Recession*****,**

Chapter 14 ***Archaeology, Architectural and Cultural Heritage*****,**

Chapter 15 ***Material Assets*** **and Chapter 16** ***Major Accidents and Disasters*****.**

18.3.1.2 Residual Effects

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

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

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

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

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

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

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

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

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

18.3.2 Roads and Traffic

18.3.2.1 Mitigation and Monitoring Measures

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.

The Indaver Staff Mobility Management Plan is included in **Appendix 7.2**.

Staff Operational Hours

As outlined in this assessment, 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.

Similarly, during the construction stage in 2022, restrictions on arrivals and departures have been proposed which will ensure that no vehicles (construction staff and HGV's) will arrive or depart the site during the AM and PM network peaks. Instead, these movements will occur during hours with sufficient reserve capacity on the local road network.

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. The Port's approach includes a number of key elements, as outlined in **Section 8.7.1** of the ***Traffic & Transportation*** chapter of the EIS documentation submitted as part of their planning application:

- Development and use of a booking system to manage freight arrivals and departures;
- Controlling and optimising gate operations to regulate HGV flow;
- Extended operating hours to allow the Port to operate outside of the AM and PM peaks; and
- The use of IT solutions to disseminate information to hauliers regarding port operations and traffic conditions.

Through the above measures, it is stated that the number of arrivals and departures can be controlled and reduced to an acceptable level.

The principle of mobility management is key in the Ringaskiddy area, where there are peak periods that experience high traffic flow, and corresponding inter-peak periods with significant spare capacity on the road network. Though the Port of Cork has completely different operational requirements to an incinerator with

energy recovery, Indaver recognise the need for a similar approach to mobility management of HGV traffic.

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.

It is noteworthy that regardless of traffic conditions in the Ringaskiddy area, Indaver must have control over the delivery of waste material, including advanced notification of the type of waste material to be delivered, and the date of delivery. This is due to the need to control the calorific value of the mix of waste accepted at the facility at any one time. Consequently, Indaver already adopt a robust approach to the advance planning of the acceptance of waste at specific times.

Adopting this system will ensure that the effect of HGV traffic flows associated with the facility will be minimised during peak periods, and that truck queuing in and out of the facility will be nominal. The HGV mobility management plan covers all stages of delivery, from pre-arrival, through to arrival and presence on-site, and departure. The system works as follows:

- Step 1 – The Indaver waste planner uses the booking system to create a high-level waste delivery plan;
- Step 2 – A week in advance, the waste planner in consultation with clients, creates a sales order for each delivery. This includes information about the customer, the waste type and the allocated delivery slot;
- Step 3 – The waste delivery arrives at the facility – note that drivers cannot enter the facility without checking in with the gate-keeper and receipt of a swipe card;
- Step 4 – The gate-keeper matches the delivery in question with the relevant sales order, the booking system records the arrival time and vehicle registration number, the driver receives a swipe card and a delivery docket;
- Step 5 – The driver swipes the card at the weighbridge, recording the entry weight and time, and the driver enters the site;
- Step 6 – The driver proceeds to the waiting zone outside the tipping hall, hands in the delivery docket, and proceeds to a tipping gate when instructed to do so;
- Step 7 – After tipping, the driver returns to the weighbridge;
- Step 8 – The driver swipes his card at the weighbridge, recording the exit weight and time, completing the delivery. An automatic record of the delivery is printed at the gatehouse; and

- Step 9 – The driver parks outside the gatehouse, returns his swipe card to the gatekeeper and received the printed delivery record. The driver then leaves.

At restriction periods, the number of available slots at the facility will be restricted in order to control the arrival of vehicles at the site. Turnaround time at the facility is approximately 25 minutes.

In addition to the proposed HGV Mobility Management Plan, the proposed extended operating hours of 06:00-20:00 will allow hauliers to schedule their deliveries to the proposed facility outside of the prevailing AM and PM network peak hours. Discussions with operators has suggested a strong preference for the proposed extended operating hours at the site, allowing these clients to schedule their deliveries outside of peak traffic times.

Indaver already employ a dedicated waste planner for the Meath facility who maintains communications with customers as part of their role; Indaver also already uses a web-text service for the Meath facility, to disseminate general announcements. Indaver proposes to have a dedicated waste planner and associated communications tools including a web-text service in Cork to allow hauliers and other customers to communicate with the Indaver Waste Planning Department quickly and efficiently regarding operations at the facility and prevailing road and traffic conditions.

The booking system allows Indaver to keep records of all arrivals and departures at the facility and can generate records for review by the local authority in order to demonstrate the efficacy of the proposed Mobility Management Plan, including arrival, entry and departure times, turnaround times and longer-term delivery trends.

Figure 7.3 shows a screenshot of the existing online planning tool in operation at the Meath facility. A step-by-step process flowchart of the HGV Mobility Management Plan is included in **Appendix 7.3**.

As outlined in Chapter 7, Indaver have an established practice for the scheduling of arrivals and departures of waste delivery vehicles. This system creates and maintains arrival and departure records and can be reviewed as necessary.

Indaver have also prepared a staff Mobility Management Plan, which is subject to annual review to establish the success of the plan and to set out targets for the subsequent year of operation.

18.3.2.2 Residual Effects

Regardless of whether or not the RRRC proceeds, there are ongoing capacity issues on the local road network at a number of key junctions, particularly at Shannon Park and Shanbally roundabouts, and at the Raffeen Bridge junction. The majority of the issues at these junctions are associated with the morning and evening network peak periods (08:00-09:00 and 16:45-17:45), with the Shannon Park roundabout and Raffeen Bridge junction also quite busy in the early portion of 18:00-19:00 period (although less so than the two periods mentioned above).

However, as outlined above, ongoing improvement works at Shannon Park roundabout are expected to significantly improve the performance of the junction. These works have commenced as of February 2019 and are expected to be complete by mid-2019.

The introduction of the RRRC has a moderate effect during the construction phase in the 18:00-19:00 evening period. This effect is temporary in nature as it is associated with construction activity at the site. Post-opening, the facility has minimal effect on the local road network.

Indaver have committed to scheduling construction traffic during the construction phase in 2022, and operational phase in 2023 (and beyond) so as to have a minimal amount of traffic flow to and from the site in two-hour periods in the morning and evening, thereby avoiding the peak periods outlined above in the morning and evening, and instead availing of the capacity on the local road network outside of these times.

As part of this assessment, no allowance has been made for the construction of the M28 Motorway Scheme, recently announced in the Government Capital Investment Programme (note that this scheme has received planning permission but is currently the subject of a Judicial Review). It is expected that the M28 scheme will significantly improve the operation of Shannon Park and Shanbally roundabouts by removing strategic traffic flows from these junctions, and indeed from other junctions on the local road network.

18.3.3 Air Quality

18.3.3.1 Mitigation and Monitoring Measures

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.

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.

18.3.3.2 Residual Effects

Based on the results of air dispersion modelling of process emissions, the air quality effect of the proposed facility will not be significant.

Air dispersion modelling was undertaken to assess the effect of the facility with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the dispersion modelling results, emissions from the facility are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant effect on human health. Chapter 6 Population and Human Health (Section 6.5.3.2) confirms that there will not be a significant effect on human health due to air emissions from

the facility. Conservative assumptions were made when determining the input data for the air modelling assessment and the approach used in the study leads to an over-estimation of the actual levels that will arise. In relation to the spatial extent of air quality effects from the site, ambient concentrations will decrease significantly with distance from the site boundary.

18.3.4 Climate

18.3.4.1 Mitigation and Monitoring Measures

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 (see **Table 9.6**). 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 Ringaskiddy Resource Recovery Centre will also 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.

The risk of rising sea levels due to climate change and the risk of increased flooding has been mitigated by a range of site-specific measures including the raising of the levels on the site and the adjoining road as outlined in **Section 13.3.7.2** and **Appendix 13.4** (Flood Risk Assessment). **Section 13.4.3** summarises the design for the surface water drainage and the raising of the road levels and levels on the site.

As outlined in **Section 16.3.1.2** of the ***Major Accidents and Disasters*** chapter states that there are no major accident scenarios envisaged from either flooding or coastal erosion

18.3.4.2 Residual Effects

The assessment has shown that the operational phase will not cause a significant impact on climate. 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.

18.3.5 Noise and Vibration

In order to sufficiently ameliorate potential noise and vibration effects, a schedule of noise and vibration control measures has been formulated for both construction and operational phases, where required.

18.3.5.1 Mitigation and Monitoring Measures

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 set out in Table 10.15. In addition, the inclusion of an acoustic attenuators to the aero condenser structure will be required to meet, as a minimum, the insertion loss values included in Table 10.18.

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.

Additional Vehicles on Public Roads

The noise effect assessment outlined above has demonstrated that mitigation measures are not required.

Monitoring

The facility will be licenced by the EPA through an IED licence. As part of the IED licence, annual noise monitoring will be required at the nearest noise sensitive locations to compare against the operational Emission Limit Values (ELV's). Monitoring will be undertaken during day, evening and night-time periods in accordance with the monitoring procedures included within EPA's NG4 2016 document.

Monitoring results will be submitted to the EPA for review and will also be included within the facilities Annual Environmental Report (AER) issued to the EPA.

18.3.5.2 Residual Effects

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.

The overall noise and vibration effect from the operation of the proposed facility is expected to be long term, not significant taking account of the existing noise environment and the predicted effect of the proposal

18.3.6 Landscape and Visual

Refer to Chapter 11 (Landscape and Visual) for detailed analysis, in particular Table 11.2 in relation to the significance of landscape and visual effect during construction and operational phases.

Mitigation measures have been included in the design and will be implemented in the development of the proposed development. The primary objectives of the proposed mitigation measures include to:

- Reduce visual effects through careful and sensitive design of the built elements.
- Assist the visual integration of the development on the site into the surrounds and reduce landscape effects with an appropriate scale of planting.

18.3.6.1 Mitigation and Monitoring Measures

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 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 are illustrated in Figures 11.38-11.41, along with the more detailed landscape masterplan drawings and sections (Drawing No. 6124_300-303). These proposals 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. The mounding shall predominantly be around 1 in 1.5 to 1 in 2 slopes although the height will vary in places and therefore will be of differing heights dependant on the shape and space available along the boundary at different sections of the site. They are intended not to be uniform in shape and height but to form more natural organic forms which relate to the existing contours of the site. They will in general, form bunds of 1-3m high and will effectively screen many close views.

The overall strategy for the landscape planting proposals throughout the site is to utilise and emulate the species that are already present on the site. Retaining as much vegetation as possible and also planting with the same native species as found in the local area will blend the site visually with the surrounding established vegetation particularly when viewed from a distance. The triangular field at the top of the embankment to the south west of the site will provide habitat enhancement, transitioning it from improved agricultural grassland to an area of more diverse natural meadow grassland, as set out in Chapter 13, Soils, Geology, Hydrogeology, Hydrology and Coastal Recession of this EIAR.

Along the northern boundary, the direction where most views of the site are from, the planting shall be dense mixed deciduous and evergreen planting on the earth mounds, using a range of age and sizes of tree, up to semi mature to provide some instant screening effect. The planting shall have a high percentage of the evergreen species for year-round screening in particular pine which is found throughout the area. The mounds will be planted with native woodland and over time as this establishes and grows in height the building will become even less visible. This planting will occur during the first planting season (November – March) after all of the construction works have been completed.

The landscape treatment along to the northern boundary of the site from Gobby Beach to Western Fields will create a more ‘campus’ style landscape reflecting the evolving change of the nearby NMCI, UCC ERI Beaufort, and Haulbowline campuses. At the entrances to the site larger semi mature species shall be planted for immediate effect. Closer to the buildings, the planting areas will predominantly be used for higher woodland planting rather than grasses or shrub planting to minimise visual effects. To the east of the site, along the coast there is currently an area of dry heathland, with scrub. A native grassland/scrub habitat will be maintained along the proposed public amenity walkway which will travel through the area. Between the footpath and site, a mixture of native scrub and taller oak and pine woodland will be planted to assist in screening close range views of the development from the walkway.

The site will require security, wire mesh type fencing which will be coloured matt black and will be set back from the public road and will be located within the planting on the internal slopes of the mounding where possible to reduce the

visual effect and retain a vegetated boundary to the public footpath. To the south the site will be fenced, and the existing boundary hedgerows supplemented where these have been retained and replanted where there has been disruption due to the construction phase.

The lighting effects have been illustrated from particular viewpoints in the three night time photomontages (viewpoints 11.17, 11.25 and 11.36). Relatively low-level lighting has been proposed to reduce night time effects on the wider area while still illuminating the entrances and exits.

Reinforced grass slopes will be used where possible instead of concrete retaining walls for environmental, biodiversity and to a lesser degree visual reasons as these are generally required to the rear of the main process building, tanks and pump house where the visual effect will be screened. Similarly, reinforced grass areas will be provided in the 'shutdown yard'.

A new bitumen macadam footpath will be constructed to give access from Gobby Beach to the Martello Tower. It is proposed to run along the eastern edge of the site and will be fenced with a low timber fence along the eastern edge. A viewing area will be provided at the higher south east corner of the site providing expansive views over Cork harbour, Spike Island and Cobh. The footpath will then run along the elevated southern boundary of the site towards the Martello Tower. There will be low additional mounding and planting to the northern edge of the footpath to mitigate any views down into the service yard of the proposed development.

In order to ensure the designed mitigation measures are effective, the construction of the proposed development must follow the design and material and colour selection as set out above and as detailed in the EIAR and accompanying architectural drawings.

In relation to landscape mitigation, it is important that stringent specifications will be employed with regard to all the planting works, and that the landscape contract will include a 12 months maintenance period during which any plants which fail will be replaced.

18.3.6.2 Residual Effects

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 development has been sensitively designed in relation to the Martello Tower protected structure in order to retain its prominence when viewed from around the harbour. The main process building is situated at a distance from the tower and aligned to have its narrowest part face the tower. The development does not block views of the tower from most viewpoints around the harbour. The building has been set down as far as possible into the ridgeline and appears to be at a similar or lower height than the Martello tower from most viewpoints.

The stack does however extend above the height of the Martello tower although it is slender in form and set at a distance from it, and the vertical forms of the existing wind turbines and electricity pylons rise higher than the Martello tower and are located much closer to it.

As the building is large in scale, the primary purpose of the mitigation landscape planting will be to provide screening from the closer viewpoints. The building extends above this planting from all views. The landscape mitigation will also ensure that the direct landscape effects on the site, namely the planting that is to be removed during construction will be replaced and enhanced for biodiversity reasons.

Visual mitigation during the design stage also focussed on the careful design and colour selection of the main buildings. The design of the building, although large, uses colour and form to reduce its overall effects. Some of the more distant views are neutral in nature as the scale of the building is not so apparent and the development looks similar in character to the surrounding large-scale industries which are characteristic of the setting in wider and longer-range views.

Although many of the effects will be negative in nature at the operational stage this is due to the change in view from a predominantly green ridgeline, to an industrial building. However, this is in the context of an area that is already substantially modified and semi-industrial in nature.

Residual landscape and visual effects will range considerably by virtue of both the local and much broader setting of the development in its immediate context and in the wider context of the Lower Harbour. Residual effects are described in **Section 11.5** and in **Table 11.2**, and range generally from slight neutral effects at greater distances across the Lower Harbour to moderate negative effects in closer proximity to the development site. Residual effects also include a number of significant negative effects that are localised to the immediate environs of the Martello tower, and significant neutral effects along the local road fronting the site and areas at Gobby Beach.

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

The cumulative effect of these developments on the landscape character will be negative in the short term but is deemed to the positive in the medium to long term once operational as the area transitions from a slightly unkempt, semi-industrial area, to a more developed cluster of industry, energy and education campus style landscape. The proposed development will be seen in many ways as an extension of this landscape. Overall the greater surrounding area is deemed capable of absorbing the development without changing the character of the City Harbour Landscape, and the proposed development, in combination with other planned or permitted developments, will not give rise to any significant direct or indirect cumulative landscape and visual effects.

18.3.7 Biodiversity

18.3.7.1 Mitigation and Monitoring Measures

Woodland and scrub and other areas of semi-natural vegetation outside the proposed development area will be retained.

The boundary landscape planting will be predominantly of Irish native species that reflect the existing vegetation of the area. These will be derived from local native-origin stocks where possible.

The pasture in the south-western corner of the site will be managed to allow semi-natural grassland to develop. This process will be carried out under the supervision of an ecologist.

Non- native invasive plant species

Japanese Knotweed

Since the completion of the EIS in 2016, Indaver have engaged a specialist company to actively monitor and treat the stands of Knotweed at the boundary to prevent any spread onto the Indaver site. Monitoring and treatment of the stands has been ongoing since 2017.

As part of the ongoing management of the infestation at the Indaver site boundary, the site was resurveyed in May 2019 and treatment (spraying of plants where accessible from the Indaver site) will continue in the late summer/early autumn of. The monitoring and treatment will continue up to the start of construction on site and thereafter until construction is complete and as outlined in the CEMP in Appendix 5.1 to this EIAR under Section 8.

There is also the potential for Japanese knotweed to be inadvertently brought onsite in imported fill or on the wheels/tracks of construction vehicles. The supplier of fill will be required to provide a guarantee that the fill to be imported does not contain Knotweed. In addition, the fill will be inspected for signs of knotweed, prior to importation to site. The inspection of topsoil brought into the site, will be carried out according to the Standard, BS3882:2015 Specification for Topsoil.

The contractor will be required to inspect vehicles before using them on site and will pay particular attention to caterpillar tracks and where trucks and dumpers are stowed.

Rhododendron

During clearance of small sections of scrub for the development of internal tracks one rhododendron plant, which was previously hidden in dense scrub, was recorded in May 2019.

The first operation in clearing rhododendron is the cutting of individual plants. Stems will be cut as close to the ground as possible. Rhododendron material can be burnt green immediately after being cut or disposed offsite to landfill. Where burning is envisaged, contact will be made with the Local Authority to obtain permission. It is noted that only one small rhododendron plant was noted.

Some method of killing must be used as rhododendron invariably grows back vigorously when cut. Digging the stumps out of the ground is an effective way of killing rhododendron. Its effectiveness is maximized by removing all viable roots. Stumps that are dug out will be burnt along with the cut material or disposed offsite to landfill.

In all sites, follow-up work will be necessary to ensure that any small plants or seedlings which were either missed on the previous visit or have entered the site subsequently from adjacent seed sources, are removed before they reach the flowering age (10-12 years).

Badger Mitigation Measures

The sett that was previously located within the study area, but outside the proposed development area, is no longer utilised.

As a precautionary measure, a pre-construction survey and further monitoring surveys during construction for badgers will be carried out to confirm the absence of badgers and monitor any potential badger activity or re-establishment in the development area. This will minimise any potential effects on the species

If badgers are discovered at that time, the mitigation measures outlined in the NRA publication, Guidelines for the Treatment of Badgers Prior to the Construction of a National Road Scheme (NRA, 2006c), should be followed. If necessary, the following measures will be employed for all construction works where badger issues arise.

Badger sett tunnel systems can extend up to c. 20m from sett entrances. Therefore, no heavy machinery should be used within 30m of badger setts (unless carried out under licence); lighter machinery (generally wheeled vehicles) should not be used within 20m of a sett entrance; light work, such as digging by hand or scrub clearance should not take place within 10m of sett entrances.

During the breeding season (December to June inclusive), none of the above works should be undertaken within 50m of active setts nor blasting or pile driving within 150m of active setts.

Following consultation with the NPWS and badger experts, works closer to any active setts may take place during the breeding season provided appropriate mitigation measures are in place, e.g. sett screening, restricted working hours, etc.

All affected badger setts will be clearly marked, and the extent of bounds prohibited for vehicles clearly marked by fencing and signage. Bunting is an option on a temporary basis. Hazard tape is inadequate as it is prone to deterioration and damage by wind or cattle etc.

All contractors/operators on site will be made fully aware of the procedures pertaining to each sett on site.

Construction activities within the vicinity of affected setts may commence once these setts have been evacuated and destroyed under licence from the NPWS. Where affected setts do not require destruction, construction works may commence once recommended alternative mitigation measures to address the badger issues have been complied with.

Works close to badger setts or removal of badgers from a site may only be carried out under the supervision of a qualified expert under licence from the NPWS.

Bird Mitigation Measures

The Wildlife Act 1976, as amended, provides that it is an offence to cut, grub, burn or destroy any vegetation on uncultivated land, or any such growing in any hedge or ditch from the 1st of March to the 31st of August. Exemptions include the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure is intended to be provided. Where possible vegetation will be removed outside of the breeding season. Where vegetation is removed during the breeding bird season, a bird survey will be carried out prior to commencement of removal and appropriate mitigation will be specified if required.

Retention of the native hedges along the southern boundaries will reduce the loss of breeding and nesting habitat for birds. Some new hedgerow will also be planted along this boundary, a tree line along the northern boundary will be removed, however replacement planting is proposed.

NRA guidelines on the protection of trees and hedges prior to and during construction should be followed (NRA, 2006b). Primarily native species will be utilised for new planting at the site. The development of a more species rich sward on grassland in the southwest of the site will in time provide additional feeding resources for birds.

The coastal protection works will take place outside the main wintering season.

Otter Mitigation Measures

No signs of otter or otter holts were noted within 300m of the proposed development. However, otters do occur within the wider landscape and are common within Cork Harbour. A detailed pre-construction survey will confirm the absence of otter holts within 150m of the proposed development area.

Any holts found to be present will be subject to monitoring and mitigation as set out in the NRA Guidelines for the Treatment of Otter prior to the Construction of National Road Schemes (2006b). If found to be inactive, exclusion of holts may be carried out during any season. No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance will also not take place within 15m of such holts, except under license. The prohibited working area associated with otter holts will be fenced and appropriate signage erected. Where breeding females and cubs are present no evacuation procedures of any kind will be undertaken until after the otters have left the holt, as determined by a specialist ecologist. Breeding may take place at any season, so activity at a holt must be adjudged on a case by case basis. The exclusion process, if required, involves the installation of one-way gates on the entrances to the holt and a monitoring period of 21 days to ensure the otters have left the holt prior to removal.

Marine Mitigation Measures

Coastal protection works will take place outside the main wintering season for birds which runs from October to March.

As outlined in Section 13.4.4, 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.

18.3.7.2 Residual Effects

The EPA document Guidelines on the information to be contained in Environmental Impact Assessment Reports (draft August 2017) provides a standard scheme for classifying effects as detailed in **Table 12.1** of Chapter 12 of this EIAR Based on this classification scheme the effects of the proposed development are classified in **Table 12.18** and repeated here.

Table 12.8 Predicted effects

Potential Effect	Predicted effect
Indirect effects due to increased noise and disturbance during the construction phase of the development	The effect is predicted to be short-term and not significant
Indirect effects on the terrestrial biodiversity due to the spreading of invasive species during site works	The effect is predicted to be imperceptible.
Indirect effects on the adjoining beach, effects could arise from increased noise and disturbance associated with the coastal protection works.	The effect will be short-term and not significant.
Indirect effects on the marine environment could arise during construction from increased run-off of suspended solids or from inadvertent spillages of hydrocarbons during construction works.	The effect will be short-term and not significant.
Direct effects due to be a net, permanent loss of an area of semi-natural terrestrial habitat	There will be a permanent, slight effect in respect of habitats within the site. There will be a permanent, slight effect on terrestrial birds, mammals and other fauna due to the loss of habitat.
Direct effects on the ecology of the upper shore from the beach nourishment scheme	This will be a medium-term, not significant effect.
Indirect effects due to increased traffic and noise associated with the site could	For construction traffic the effect will be short-term and not significant. During

potentially increase levels of disturbance which could result in the disturbance/displacement of birds and mammals such as otter and seals.	operation the effect will be long term and not significant.
Direct effect from the stack of the main process building which could theoretically create a collision risk for birds thus leading to a risk of increased bird mortality and potential subsequent effects on bird populations.	Any significant collision risk is considered unlikely and thus the effect is predicted to be long term and not significant.
Indirect effect due to emissions to air could theoretically have eco-toxicological effects particularly on piscivorous birds, otters and seals due to bioaccumulation.	The effect is predicted to be long-term and imperceptible.
Indirect effect on nesting birds as the importation of organic waste could attract increased predator numbers.	The effect is predicted to be long term and imperceptible
Indirect effects from accidents during operation or during the transport of ash and flue gas residues could theoretically effect on marine ecology.	The risk of significant accidents is considered unlikely and the effect is predicted to be imperceptible.

In conclusion the development is not predicted to have a significant effect on terrestrial and marine ecology. The cumulative effect will not be significant. The effect on European Sites, which was also specifically addressed by a Natura Impact Statement, will be imperceptible.

18.3.8 Soils Geology Hydrology and Hydrogeology

18.3.8.1 Mitigation and Monitoring Measures

Soils and Geology

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 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.

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.

All underground process piping or process drains, which will contain liquids which could cause contamination, will be double contained and regularly maintained and inspected for integrity.

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. Refer to **Section 4.5.7** of **Chapter 4** ***Description of the Proposed Development*** of this EIAR, for a description of the firewater containment systems.

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**.** Refer to **Section 4.14.3** of **Chapter 4** ***Description of the Proposed Development*** of this EIAR for a description of drainage systems.

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. Refer to **Section 4.14.3** for a description of the measures which will be in place to control any spillage from tanker unloading operations.

Landslide Risk

The proposed placement of sacrificial beach nourishment material will mitigate the potential landslide hazard, which is primarily confined to the shore line at the site.

Hydrogeology

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, refer to **Section 4.14.3** of this EIAR. 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.

The measures described above, to prevent contamination of soils which would have a negative impact on soils and geology during operations, will also prevent contamination of groundwater and a negative impact on hydrogeology during operations.

A network of groundwater monitoring wells will be installed on the eastern part of the site. Regular monitoring of groundwater will be a requirement of the industrial emissions licence. The monitoring will detect any changes in groundwater quality during the operational phase of the facility

Hydrology

During operation, as described above, surface water will be contained within the site. The surface water discharge will be monitored prior to discharge and if an out of specification reading is detected the pumps will be shut off and all contaminated runoff will be contained within the retention tank system i.e. both surface water tanks.

In the event of a fire on site, the water used for fire-fighting will be retained.

As discussed previously in Chapter 13, 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. Refer to **Appendix 13.4** ***Flood Risk Assessment*** for further details. 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 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.

With the mitigation measures in place, there will be no impact on surface water as a result of the operation of the proposed development.

Coastal Recession

Refer to **Section 13.5.5.2** of Chapter 13. The sacrificial material will be reapplied during the operational period as required. No other mitigation measures are proposed.

As discussed in **Section 13.4.4** of Chapter 13, it is proposed that proactive monitoring be carried out over a six-year period on the glacial till slope erosion rate to indicate if there is some acceleration in the current erosion rate, or when the glacial till slope has retreated by approximately 3m, whichever is sooner.

It is proposed that the placement of further additional sacrificial material (shingle) is carried out if the glacial till slope erosion rate is more than 0.5m per year measured over a period of six years.

The proactive monitoring will comprise:

- Annual topographic surveys which will include 0m contour, top and bottom of glacial till face monitoring and specified sections.
- An assessment of the retreat and reporting over the design life of the proposed development including the construction period (40 years).
- Proactive and reactive management of the beach comprising placement of imported shingle to areas of the beach where deemed necessary from beach monitoring data.

The main aim of placing the material is to act as a proactive measure for the coastal area adjacent to the Indaver site only. The solution will have no negative effects on the adjoining areas. However, there will be benefits associated with the works as well as the provision of an environmentally friendly solution. The net coastal sediment transport goes from south to north according to wind conditions and swell; therefore the material is likely to move towards the north in the medium and long term. The Cork Harbour Special Protection Area (SPA) is located to the south west of the site and therefore the sacrificial material will not impact on the SPA. Refer to **Appendix 13.3** for further details.

The 2016 coastal erosion report addendum (**Appendix 13.5** of this EIAR.) confirmed this approach and recommended the study area to be continually monitored as part of the beach monitoring plan as recommended in the Coastal Erosion report (**Appendix 13.3**).

Monitoring for the IE Licence

As discussed previously, under the Industrial Emissions Licence, the EPA may require Indaver to carry out monitoring as conditions to the licence. The results of which will be reported annually to the EPA as part of the Annual Environmental Report. The monitoring requirements will be set by the EPA as part of IE Licence application process.

18.3.8.2 Residual Effects

It is expected that, with the implementation of the mitigation measures described above, the construction and operation of the proposed development will not result

in significant negative effects on soils, geology, hydrology or hydrogeology and coastal recession. There will be a positive impact on the L2545 due to the improvement in drainage.

The placing of the sacrificial material, acting as beach nourishment on Gobby Beach above the foreshore, will reduce the rate of recession of the glacial till slope along the eastern site boundary. It is noted that the construction effects experienced during the placement of the shingle will be repeated when the shingle is reapplied in the future.

With the application of the sacrificial material, there will continue to be no impact from coastal erosion on the entire proposed development after 30 years. With the application of the sacrificial material, the diverted gas pipeline will not be impacted after 40 years. However, there is still low a risk of an impact on small section of the amenity walkway and viewing platform after 40 years.

The waste-to-energy section of the proposed development will not be impacted by coastal erosion for the entire duration of the planning permission.

The coastal protection measures will have no negative effects on the adjoining areas. However, there will be benefits associated with the works as well as the provision of an environmentally friendly solution. The net coastal sediment transport goes from south to north according to wind conditions and swell, therefore the material is likely to move towards the north in the medium and long term. The Cork Harbour Special Protection Area (SPA) is located to the south west of the site therefore the sacrificial material will not impact on the SPA.

18.3.9 Architectural, Archaeological and Cultural Heritage

18.3.9.1 Mitigation and Monitoring Measures

An assessment of the visual impact of the proposed development on the Martello tower (CO087-053 and RPS No. 00575) is included in **Chapter 11 *Landscape and Visual*** and demonstrated in the photomontages prepared. The visual impact of the proposed development on the Martello tower will be mitigated in the following ways:

- The waste-to-energy facility will be located in a substantial cut at the eastern end of the site screening much of the development from view.
- No buildings will be located along the southern site boundary adjacent to the Martello tower and the existing field boundary will be retained. The view from the tower to the north, over Haulbowline Island and the Great Island will be unaffected.
- The upper portion of the main process buildings and the upper portion of the stack will be visible from the top of the ridge and the Martello tower when looking northeast towards Spike Island. The orientation, massing and colouring of the main process building has been designed and laid out to reduce the visual impact on the Martello tower. The main process building will be coloured varying shades of natural green to blend with the darker shades of the ridge background and lighter sky shades at the higher levels. The stack will be coloured off white/grey. Periodically, depending on climatic and/or

atmospheric factors, including temperature and wind speed, a short, thin steam plume may be visible from the stack.

The amenity walkway from Gobby Beach to the southern boundary of the Indaver lands and the associated viewing platform will facilitate public access to the Martello tower. The construction of the path will have a positive effect on the accessibility to the monument by providing a formalised route to it through Indaver owned lands.

18.3.9.2 Residual Effects

The cutting of the landscape through which the path to the Martello tower previously ran, as indicated on the 1st, 2nd and 3rd edition OS maps, will permanently alter the landscape of the line of the access route to the tower from Gobby Beach and will have a profound negative effect on the line of the path. However, the path no longer exists, and this area appears to have been previously used as a cut area during reclamation in Ringaskiddy.

If archaeological features are revealed during archaeological investigation and are preserved by record they will be permanently removed from the cultural landscape and profoundly negatively affected. However, any features revealed will be preserved by record through full archaeological excavation as outlined in Policy and Guidelines on Archaeological Excavation – Department of Arts, Heritage, Gaeltacht and the Islands. The findings of such excavations will add to our understanding of how past communities lived in the area.

The landscape in which the Martello tower was constructed in the early 19th century has been significantly modified over the last two centuries. Extensive reclamation, industrialisation, growth in residential development throughout much of the harbour and urbanisation of the town of Cobh have combined to change the rural landscape setting of the early 19th century tower.

There will be a residual significant negative effect on the setting of the Martello tower and the view to and from it. The stack and main process building will be visible from the tower and will obstruct the view northeast from it. The view of Fort Mitchell (Westmorland Fort) on Spike Island will not be obstructed but the view of the north-western part of the island will be. The visibility over and intervisibility between the tower and the contemporary military defences in the lower harbour at Haulbowline, Spike Island, Carlisle Fort and Camden Fort will not be affected. The view of the Martello tower from within the harbour and surrounding landscape will be altered. It's position of prominence on the Ringaskiddy peninsula will be diminished by the large-scale nature of the industrial facility and the greenfield setting of the tower will become more industrialised in nature. The view of the tower from a narrow section of the harbour northeast of Spike Island to the south easterN tip of the Great Island at Marloag Point will be obscured by the main process building. The visual landscape of the Martello tower will be permanently affected and altered.

18.3.10 Material Assets

18.3.10.1 Mitigation and Monitoring Measures

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.

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.

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.

Coastal protection mitigation measures are not required for the waste-to-energy facility element of the development. However, given the concerns raised by An Bord Pleanála previously and given the low risk that the amenity walkway and a section of the diverted gas pipeline could be impacted in 40 years' time, coastal protection measures have been included in the 2016 planning application and in this EIAR as a precautionary measure so as to reduce the rate of erosion of the glacial till face. Sacrificial beach material (shingle) will be placed at the toe of the glacial till face (above the foreshore) on Gobby Beach in order to reduce erosion rates. Refer to **Chapter 13 *Soils, Geology, Hydrogeology, Hydrology and Coastal Recession*** for further details.

Access to Gobby Beach (aside from the beach area proposed for the coastal protection works) will be maintained for the duration of the construction works.

18.3.10.2 Residual Effects

When the facility is in operation it will have a beneficial residual impact in the reduction in the quantity of hazardous waste being exported to Europe for disposal and in the reduction in the quantity of non-hazardous industrial, commercial and municipal solid waste and sludge going to landfill or being exported from Ireland.

The operation of the waste-to-energy facility will have residual effects in relation to the consumption of resources as outlined in **Table 4.13** of **Chapter 4 *Description of the Proposed Development*** of this EIAR.

Boiler ash and flue gas residues will be landfilled in a hazardous waste landfill or sent for recovery in a salt mine. These residues will be sent to a salt mine in Ireland for recovery or exported to landfill or to a salt mine in Germany, if no suitable facility is available in Ireland by the time the plant is commissioned.

The proposed development will also have a number of positive residual effects on material assets. The bottom ash that is generated as a result of the incineration process is reused in many EU countries for use in road construction. Indeed, export of bottom ash for processing to other EU countries may be a route to achieve this if no facility is available in Ireland. Landfilling of these solid residues will only take place, if no viable market can be found. If these residues can be

successfully used, it will have a positive effect in that it will reduce the requirement for the use of virgin materials.

The proposed development will have a beneficial residual impact as it will reduce the quantity of hazardous waste being exported to Europe for disposal.

It will also reduce the quantity of non-hazardous industrial, commercial and municipal solid waste going to landfill and also the need to export municipal solid waste for thermal treatment/recovery in Europe.

In addition, the proposed facility will produce approximately 21MW of electricity, with approximately 18.5MW for export to the National Grid. This is enough energy to power approximately 30,000 homes annually and replaces non-renewable fossil fuels in the generation of electricity, which is a very positive long-term residual impact.

As discussed above and in **Chapter 13 *Soils, Geology, Hydrogeology, Hydrology and Coastal Recession***, coastal protection measures are proposed to slow the erosion rate of the glacial till face. With the application of the sacrificial material, there will continue to be no impact from coastal erosion on the entire proposed development after 30 years. With the application of the sacrificial material, the diverted gas pipeline will not be impacted after 40 years. However, there is still low a risk of an impact on small section of the amenity walkway and viewing platform after 40 years.

Finally, the upgrade of the drainage network on the L2545 will result in a positive residual effect as the risk of flooding on the road will be reduced.

18.3.11 Major Accidents and Disasters

18.3.11.1 Mitigation and Monitoring Measures

In assessing the risks presented at each installation within the site, the HAZID&RA noted a range of measures that will be in place to mitigate the risks associated with the various accident scenarios identified at each area of the site that was assessed. The areas assessed were as follows:

- Bunker;
- Furnace;
- Boiler;
- Dry Reactor;
- Activated Carbon Silo;
- Bag House;
- Flue Gas Residue Storage;
- Flue Gas Cooling Section (water quench / heat exchanger);
- ID Fan;
- Stack;
- Aqueous HCl IBC;

- Piperacks;
- General storage area (fuel oil, ammonia and aqueous waste tanks).

For those areas identified as presenting a credible risk of a significant accident scenario, the scenarios were documented and assessed in the HAZID&RA worksheets, which are included in **Appendix 3** to the HAZID&RA report (**Appendix 6.1** of this EIAR). The worksheets were also used to document the risk reduction and mitigation measures that will be in place to protect against these scenarios.

Based on the findings of the HAZID&RA exercise, there were no scenarios identified which presented a Priority Risk (see **Error! Reference source not found.**) and there was one scenario which presented a Substantial Risk. This scenario involved a fire at the bunker. This scenario received a Severity Rating of 3, for both Human Health and for the Environment, and a Likelihood Rating of 4, giving the scenario a Risk Rating of 12. As such the risk assessment team examined the risk reduction measures planned for this area to ensure that all necessary measures would be in place to protect against this scenario.

Risk Mitigation Measures at Bunker

As noted above, 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 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.
- 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.

These measures govern all stages of the potential development of this scenario. The measures will protect against the conditions arising under which a fire could occur, they will enable rapid detection and response at the early stages in the event that a fire scenario developing, they will enable extinguishment of the fire even in the event of escalation to a fully developed fire scenario, and protect against the risk of environmental contamination from fire-fighting run off.

With these measures in place, the HAZID&RA found that Indaver would have all necessary measures to in place at the bunker, throughout all phases of the

operation. As such the risks associated with this scenario were considered to be ALARP (as low as reasonably practicable).

During the course of the planning oral hearing in April and May 2016 held by ABP, concerns were raised about the ability of people to safely leave Haulbowline Island during such an event. The analysis in the HAZID&RA Report (**Section 2.8.1**) shows that that the worst case thermal radiation levels at the closest point to the bunker fire on the public road (approximately 43 m to centre of the road) would result in exposure levels of 6.3 kW/m^2 at this point. Only 9 metres away on either side of this point, the worst case thermal radiation levels drop to 4kW/m^2.

Referring to guidance from the Chemical Industries Association (CIA)[1], a heat flux of 6.3 kW/m^2 is established as the maximum level of thermal radiation for safe escape in the event of a fire. Based on the modelling results for this worst case fire scenario it is possible to travel along the road past the site during a fully developed bunker fire without exceeding this threshold. However, the CIA guidance is for evacuation from an emergency exit from a building and, although it is not stated explicitly as such in the guidance, it is generally understood that this is applied when evacuating away from a fire rather than travelling towards it to pass through a zone, which would result in a longer exposure time. However, for people in vehicles using the road, any exposure would be reduced due to reduced exposure time.

In practice, if this scenario developed the emergency services may decide to impose road blocks to restrict traffic movements. If so, there is an alternative route through the campus of the IMERC and Maritime College which was identified at the planning oral hearing in 2016 that could be utilised. People travelling by this route would be exposed to less than 1 kW/m^2 in the event of a fully developed bunker fire, which is equivalent to the heat generated on a sunny day in summer. As such people could leave safely by this route.

Risk Mitigation Measures at Containment Areas

The following risk reduction and risk mitigation measures will be put in place to protect against accident scenarios involving loss of containment of materials in tanks or IBCs.

- 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).

[1] "Guidance for the location and design of occupied buildings on chemical manufacturing sites" (Chemical Industries Association)

- 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.

Other Control Measures (general, site-wide measures)

In addition to identifying area-specific measures, the risk assessment also noted a series of other measures which provide risk reduction or mitigation across multiple site areas.

- 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.
- Fire-fighting systems / water main and water cannons.
- Spill kits.
- Emergency response team.

Based on these assessments, and on the controls that will be implemented as risk reduction and risk mitigation measures at the site, the risks associated with accident scenarios at the Indaver facility in Ringaskiddy were found to be ALARP.

Monitoring

Indaver will ensure that there are appropriate controls in place (infrastructural and procedural) to manage the risks associated with the planned operations at the resource recovery centre.

Indaver will also install detection and alarm systems to enable operators to rapidly detect and respond in the event of process deviations or accidents developing at the site. These will include:

- Oxygen monitoring at the furnace, with interlocks on the supply to ensure excess oxygen and protect against incomplete combustion.
- Interlocks will also be installed to prevent oil flow to the furnace when burners are not firing.
- Vibration detection on the fan at the furnace.
- Periodic cleaning of the furnace as part of the preventative maintenance programme, to protect against the risk of slag accumulation on the walls of the furnace.
- UV/IR detection systems.
- Pressure gauge at the burner, with interlocks to bring system to safe shut down.
- Process control system at the boiler system, linked to temperature monitors.
- Monitoring of stack emissions.
- Indaver will implement an automatic purge control sequence before the boiler is fired.
- Process controls to detect pressure drop at the bag house, with alarm.
- Process controls with temperature and weight detection at the bag house.
- Screening assessments of deliveries to the site. Indaver will also conduct investigations where issues arise with waste arriving on site (e.g. waste arriving in a damage container).
- Preventative maintenance programme to ensure that plant and equipment remains fit for purpose.
- Overfill protection systems on storage tanks (level gauging and level switches).

Indaver will also conduct daily visual inspections of the site.

18.3.11.2 Residual Effects

A discussion of the effects arising from normal operations of the plant is provided in other chapters of this EIAR. There are no residual effects associated with the scenarios discussed in this chapter, except in the case of an accident scenario. In the event of an accident occurring during operations, Indaver will have emergency response measures in place to minimise the impacts to human health and to the environment.

As the site will be licensed by the EPA, Indaver has conducted an environmental liabilities risk assessment (ELRA) and prepared a closure restoration and aftercare management plan (CRAMP), in accordance with the EPA's guidance[2]

[2] "Guidance on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision"

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

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

18.3.12 Cumulative Effects

18.3.12.1 Mitigation and Monitoring Measures

No specific mitigation or monitoring measures proposed for cumulative effects. Refer to other sections of the EIAR.

18.3.12.2 Residual Effects

No significant residual effects predicted.