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Environmental Impact Assessment Report (EIAR)

Seskin Wind Farm, Co.
Carlow

Chapter 16 – Major Accidents and Natural
Disasters



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16.

MAJOR ACCIDENTS AND NATURAL DISASTERS

16.1

Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the likely significant adverse effects on the environment arising from the vulnerability of the Proposed Project as detailed in Chapter 4 to risks of major accidents and/or natural disasters, as well as the potential of the Proposed Project itself to cause potential major accidents and/or natural disasters. It has been completed in accordance with the guidance set out by the Environmental Protection Agency (EPA) in 'Guidelines on Information to be contained in Environmental Impact Statements' (EPA, 2022) and the European Commission in relation to Environmental Impact Assessment of Projects (Directive 2011/92/EU, as amended by 2014/52/EU), namely 'Guidance on the preparation of the Environmental Impact Assessment Report'.

The assessment of the vulnerability of the Proposed Project to major accidents and/or natural disasters, as well as the risk of the Proposed Project itself causing major accidents and/or natural disasters is carried out in compliance with the EIA Directive (2014/52/EU) which states the need to assess:

"the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or natural disasters which are relevant to the project concerned."

The objective of this assessment is to ensure that appropriate precautionary actions are taken for the Proposed Project.

"because of their vulnerability to major accidents and/or natural disasters, are likely to have significant adverse effects on the environment".

Based on the requirements of the EIA Directive, this chapter seeks to determine:

- The relevant major accidents and/or natural disasters, if any, that the Proposed Project could be vulnerable to or could cause;
- The potential for these major accidents and/or natural disasters to result in likely significant adverse environmental effect(s); and
- The measures that are in place, or need to be in place, to prevent or mitigate the likely significant adverse effects of such events on the environment.

The full description of the Proposed Project is provided in Chapter 4 of this EIAR.

As detailed in Section 1.1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Project', 'the site', 'Proposed Wind Farm' and 'Proposed Grid Connection Route'.

16.1.1

Statement of Authority

This section of the EIAR has been prepared by Catherine Johnson and reviewed by Ellen Costello, both of MKO. Catherine is an Environmental Scientist at MKO with over one year of consultancy experience in climate and sustainability. Prior to joining MKO in 2022, Catherine worked as an Environmental Social Governance (ESG) analyst for Acasta in Edinburgh. Catherine has expertise in international climate law and policy, earth science, and sustainability/ESG processes. Catherine has a BSc in Earth and Ocean Science and an LLM in Global Environment and Climate Change Law. Ellen

is a Project Environmental Scientist and Climate Practitioner with over four years of consultancy experience with MKO and has been involved in a range of projects including climate and sustainability context reports for masterplans and commercial developments, renewable energy infrastructure projects, and the compilation of numerous chapters including the preparation of major accidents and natural disaster chapters for Environmental Impact Assessment Reports. Ellen holds a BSc. in Earth Science and a MSc. in Climate Change: Integrated Environmental and Social Science Aspects where she focused her studies on climate adaptation and mitigation, and its implications on environment and society. This report has been reviewed by Sean Creedon (B.Sc., M.Sc.). Sean has 22 years' experience in planning and environmental impact elements within all stages of wind farm project delivery.

16.2 Assessment Methodology

16.2.1 General

The following sources of information and literature pertinent to the area were used in the preparation of this section:

- Census of Ireland 2016; 2022
- Regional Planning Guidelines for the South-East Region 2010-2022
- Regional Spatial and Economic Strategy (RSES) 2019-2031, adopted by the Eastern and Midland Regional Assembly (EMRA) in June 2019 and published by the Southern Regional Assembly (SRA) on 31st January 2020.
- Carlow County Development Plan 2022-2028
- Kilkenny City and County Development Plan 2021-2027
- Carlow County Council Website, Kilkenny County Council Website, and
- Fáilte Ireland

Major accidents or natural disasters are hazards which have the potential to affect the Proposed Project and lead to environmental effects directly or indirectly. These include accidents during construction, operation and decommissioning of the Proposed Project caused by operational failure and/or natural hazards. The assessment of the risk of major accidents and/or natural disaster is considered in relation to the information required to be provided in the EIAR, i.e. population and human health, biodiversity, land, soil, water, air, climate and material assets, cultural heritage and the landscape.

16.2.2 Legislative Context

16.2.2.1 Legislation

An assessment of the following key elements was undertaken in accordance with the EIA Directive (2014/52/EU):

- The vulnerability of the Proposed Project to potential accidents and disasters
- The Proposed Project potential to cause major accidents or disasters which pose a risk to human health, cultural heritage and/or the environment.

The information relevant to major accidents and/or disasters to be included in the EIAR is set out in Section 8 of Annex IV of the EIA Directive as follows:

“(8) A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the

requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies”.

16.2.2.2 Guidance Documents

The following guidance documents have been consulted in the preparation of this section:

- European Commission. (2017). Environmental Impact Assessment of Projects – Guidance on the preparation of Environmental Impact Assessment Reports
- Environmental Protection Agency (2022), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports
- Department of Environment, Heritage and Local Government (2010) *A Guide to Risk Assessment in Major Emergency Management*
- Environmental Protection Agency (2014) Guidance on Assessing and Costing Environmental Liabilities
- Department of Defence (2020) A National Risk Assessment for Ireland
- Carlow County Council Major Emergency Plan 2020
- Fire and Emergency Operations Plan 2022-2026 - Kilkenny County Council Fire and Rescue Service
- HSE Emergency Management Area 5 Crisis Management Team Major Emergency Plan: Covering Geographical Areas of Counties Carlow, Kilkenny, South Tipperary, Waterford and Wexford (November 2019)

On a regional scale, both Carlow and Kilkenny fall under the scope of the HSE South East (Area 5) Emergency Plan.

16.2.3 Categorisation of the Baseline Environment

A desk-study has been completed to establish the baseline environment for which the proposed risk assessment is being carried out. This will influence both the likelihood and the impact of a major accident or natural disaster. Local and regional context has been established prior to undertaking the risk assessment to develop an understanding of the vulnerability and resilience of the area to emergency situations.

Further detail on the baseline environment is provided in Section 16.3.

16.2.4 Impact Assessment Methodology

16.2.4.1 Introduction

A wind farm is not a recognised source of pollution. It is not subject to Industrial Emissions Directive regulation or any other Environmental Protection Agency environmental regulatory consent. Should a major accident or natural disaster occur the potential sources of pollution onsite during the construction, operational and decommissioning phases are limited and of low environmental risk. Sources of pollution with the potential to cause significant environmental pollution and associated negative effects such as bulk storage of hydrocarbons or chemicals, storage of wastes, management of flammable materials etc. are limited and so there is an inherent low level of environmental risk associated with major accident or natural disaster impacting the Proposed Project and causing environmental damage.

There is low potential for significant natural disasters to occur at the Proposed Project. Ireland is a geologically stable country with a mild temperate climate. The potential natural disasters that may occur are therefore limited to issues such as flooding and fire and are described in the sections below.

Major industrial accidents involving dangerous substances pose a significant threat to humans and the environment; such accidents can give rise to serious injury to people or serious damage to the environment, both on and off the site of the accident. The Proposed Project is not regulated or connected to or close to any site regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations i.e., SEVESO sites and so there are no potential effects from this source.

The Proposed Project has low potential to cause natural disasters or major accidents. As detailed in Section 8.3.1.3 in Chapter 8 of this EIAR, the EPA published soil map (www.epa.ie) and the GSI subsoil mapping (www.gsi.ie) for the area shows that the Proposed Project is overlain by acid peaty and non-peaty poorly drained mineral soils. The Proposed Wind Farm is mapped to be largely underlain by till derived from Namurian sandstones and shales. Areas of blanket peat are also mapped within the Proposed Wind Farm and underlies T05 and T07, and parts of the hardstand infrastructure for T03. The Proposed Grid Connection Route is located predominantly within the public road network. Soils along the Proposed Grid Connection Route are acidic deep poorly drained mineral soils and acid shallow well drained mineral soils (www.epa.ie).

Any risks associated with flooding, impacts on infrastructure, accidents etc are addressed in the sections below.

Current EIA practice already includes an assessment of some potential accidents and disaster scenarios such as pollution incidents to ground and watercourses as well as assessment of flooding events. These are described in detail in the relevant EIAR assessment chapters (Refer to Chapters 5 to 16 for further detail).

16.2.4.2 Site Specific Risk Assessment Methodology

A site-specific risk assessment identifies and quantifies risks focusing on unplanned, but possible and plausible events occurring during the construction, operation and decommissioning of the Proposed Project. The approach to identifying and quantifying risks associated with the Proposed Project by means of a site-specific risk assessment is derived from the EPA 'Guidance on Assessing and Costing Environmental Liabilities' document¹. The following steps were taken as part of the site-specific risk assessment:

- Risk Identification
- Risk Classification, likelihood and consequence, and
- Risk Evaluation

16.2.4.2.1 Risk Identification

Risks have been reviewed through the identification of reasonably foreseeable risks in consultation with relevant contributors to this EIAR. The identification of risks has focused on non-standard but plausible incidents that could occur at the Proposed Project during construction, operation and decommissioning.

In accordance with the European Commission EIAR Guidance, risks are identified in respect of the Proposed Project:

1. Potential to cause accidents and/or disasters,
2. Vulnerability to potential disaster/accident

¹ EPA (2014) Guidance on assessing and costing environmental liabilities. Available at https://www.epa.ie/publications/compliance-enforcement/licensees/reporting/financial-provisions/EPA_OEE-Guidance-and-Assessing-WEB.pdf

Classification of Likelihood

After identifying the potential risks, the likelihood of occurrence of each risk has been assessed. An analysis of safety procedures and proposed environmental controls was considered when estimating likelihood of identified potential risks occurring. Table 16-1 defines the likelihood ratings that have been applied.

The approach adopted has assumed a 'risk likelihood' where one or more aspects of the likelihood description are met.

Table 16-1 Classification of Likelihood (Source: DoEHLG, 2010)

Ranking	Likelihood	Description
1	Extremely Unlikely	May occur only in exceptional circumstances; once every 500 or more years.
2	Very Unlikely	Is not expected to occur; and/or no recorded incidents or anecdotal evidence; and/or very few incidents in associated organisations, facilities or communities; and / or little opportunity, reason or means to occur; may occur once every 100-500 years.
3	Unlikely	May occur at some time; and /or few, infrequent, random recorded incidents or little anecdotal evidence; some incidents in associated or comparable organisation's worldwide; some opportunity, reason or means to occur; may occur once per 10-100 years.
4	Likely	Likely to or may occur; regular recorded incidents and strong anecdotal evidence and will probably occur once per 1-10 years.
5	Very Likely	Very likely to occur; high level of recorded incidents and/or strong anecdotal evidence. Will probably occur more than once a year.

Classification of Consequence

The consequence rating assigned to each risk has assumed that all proposed mitigation measures and/or safety procedures have failed to prevent the major accident and/or disaster. Furthermore, the Carlow County Council Major Emergency Plan (2020), and the Kilkenny County Council Fire and Rescue Service Fire and Emergency Operations Plan 2022-2026, will work to reduce the consequence of any major accident or disaster. The consequence of the impact if the event occurs has been assigned as described in Table 16-2.

The consequence of a risk to/from the Proposed Project has been determined where one or more aspects of the consequence description are met, i.e., risks that have no consequence have been excluded from the assessment.

Table 16-2 Classification of Impact (Source: DoEHLG, 2010)

Ranking	Likelihood	Impact	Description
1	Minor	Life, Health, Welfare Environment Infrastructure Social	Small number of people affected; no fatalities and small number of minor injuries with first aid treatment. No contamination, localised effects <€0.5M Minor localised disruption to community services or infrastructure (<6 hours).
2	Limited	Life, Health, Welfare Environment Infrastructure Social	Single fatality: limited number of people affected; a few serious injuries with hospitalisation and medical treatment required. Localised displacement of a small number of people for 6-24 hours. Personal support satisfied through local arrangements. Simple contamination, localised effects of short duration €0.5-3M Normal community functioning with some inconvenience.
3	Serious	Life, Health, Welfare Environment Infrastructure Social	Significant number of people in affected area impacted with multiple fatalities (<5), multiple serious or extensive injuries (20), significant hospitalisation. Large number of people displaced for 6-24 hours or possibly beyond; up to 500 evacuated. External resources required for personal support. Simple contamination, widespread effects or extended duration €3-10M Community only partially functioning, some services available.
4	Very Serious	Life, Health, Welfare Environment Infrastructure Social	5 to 50 fatalities, up to 100 serious injuries, up to 2000 evacuated Heavy contamination, localised effects or extended duration €10-25M

Ranking	Likelihood	Impact	Description
			Community functioning poorly, minimal services available
5	Catastrophic	Life, Health, Welfare Environment Infrastructure Social	Large numbers of people impacted with significant numbers of fatalities (>50), injuries in the hundreds, more than 2000 evacuated. Very heavy contamination, widespread effects of extended duration. >€25M Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support.

Risk Evaluation

Once classified, the likelihood and consequence ratings have been multiplied to establish a 'risk score' to support the evaluation of risks by means of a risk matrix.

The risk matrix sourced from the DoEHLG *Guide to Risk Assessment in Major Emergency Management* and as outlined in Table 16-3 indicates the critical nature of each risk. This risk matrix has therefore been applied to evaluate each of the risks associated with the Proposed Project. The risk matrix is colour coded to provide a broad indication of the critical nature of each risk:

- The red zone represents 'high risk scenarios':
- The amber zone represents 'medium risk scenarios', and
- The green zone represents 'low risk scenarios'.

Table 16-3 Classification of Impact (Source: DoEHLG, 2010)

		Consequence Rating				
		1.Minor	2.Limited	3. Serious	4.Very Serious	5.Catastrophic
Likelihood Rating	5.Very Likely					
	4. Likely					
	3. Unlikely					
	2. Very Unlikely					
	1. Extremely Unlikely					

Baseline Conditions

The functional areas of Carlow and Kilkenny County Council fall under the South-East Major Emergency Region (MEM).

The Major Emergency Plan prepared by Carlow County Council (2020) outlines the following potential major emergency scenario in the county (Carlow). Please note, the 2024 Major Emergency Plan for Carlow County Council has been adopted, however it is not yet available for public viewing.

1. **Severe Weather/Urban Flooding** – Applicable to urban areas within the functional areas of Carlow County Council.
2. **Aircraft Collision / Loss** – Carlow County Council Functional Areas
3. **Water Contamination** – Carlow County Council Functional Areas
4. **Fire / Major Crowd Safety and Civil Disorder** – Carlow County Council Functional Areas
5. **Major RTA / Hazmat** – M9 motorway, National Primary Routes, Iarnród Éireann; There are currently no SEVESO sites in Carlow County Council's functional area.
6. **Rail Accident** – Carlow County Council Functional Areas
7. **Industrial Fire / Explosion** – Carlow County Council Functional Areas
8. **Critical Infrastructure** – Carlow County Council Functional Areas
9. **Methane Explosion** – Carlow County Council Functional Areas
10. **Gas Explosion on main Cork to Dublin gas line** – Applicable to sections of the line that reach Co. Carlow.
11. **Bridge Collapse** – Carlow County Council Functional Areas
12. **Structural Collapse** – Carlow County Council Functional Areas

As part of the Local Area Climate Action Plan² for County Carlow (Carlow LACAP) a Tier 1 climate change risk assessment was carried out by RPS Consulting Ltd for County Carlow. A profile of historical climate hazards in County Carlow from 1993-2008 and assessment on future climate hazards is provided in the Carlow LACAP). Future projections of climate change indicate that Above Average Precipitation, Prolonged Cold Periods and Heavy Snowfall will remain consistent with existing conditions. However, risk is predicted to increase for all other identified climate hazards (i.e., Severe Wind Storm, Extreme Precipitation, Pluvial Flooding, Heatwave, Drought, and Above Average Surface Temperature), with River Flooding remaining the perceived highest risk to County Carlow.

The Draft-Consultation Major Emergency Plan prepared by Kilkenny County Council (2022) is a part of the Fire and Emergency Operations Plan 2022-2026. The Draft-Consultation MEM associated with this Plan outlines the arrangements that will enable Kilkenny County Council to effectively manage a Major Emergency in co-operation with other the Principal Response Agencies, An Garda Síochána and the Health Service Executive. In the event of a major emergency, the primary role of Kilkenny County Council is to ensure life safety by providing a suitably trained and equipped emergency service in the form of the Fire Service. The Fire Service will prepare itself for large scale and inter-agency operations through participation in appropriate exercises.

As part of the Local Area Climate Action Plan³ for County Kilkenny (Kilkenny LACAP) a Tier 1 climate change risk assessment was carried out by RPS Consulting Ltd for County Kilkenny. The assessment included a review of the extreme weather events in County Kilkenny over the past 30 years, and the identification of the main climate hazards such as rainfall, flooding, windstorms, drought, snowfall etc and their impacts on the delivery of Kilkenny County Council services. The Kilkenny LACAP risk assessment identified the following as the most significant future risks to the delivery of

² Carlow County Council (2024) Local Area Climate Action Plan 2024-2029 <<https://carlow.ie/media/637/download?inline>>

³ Kilkenny County Council (2024) Local Area Climate Action Plan 2024-2029

<<https://kilkennycoco.ie/eng/services/environment/climate-action/kilkenny-county-council-climate-action-plan-2024-2029.pdf>>

Kilkenny County Council services (based on predicted frequency and impact): River Flooding, Extreme Precipitation, and Drought.

The risks which are most relevant to this assessment are described below:

Severe Weather

The climate change risk assessments included in the Carlow LACAP and Kilkenny LACAP detail the major risks posed from climate change being river flooding, severe wind storms, extreme precipitation, and drought. The changes in frequency in intensity of weather patterns as a result of climate change will continue to influence the wide range of functions carried out by Local Authorities. The identification of future risks is critical to enable the progression of adaptation and mitigation measures in the development and execution of plans and policies.

Potential impacts that may occur on the identified road networks could be caused by an accident during the delivery of the turbines, collisions onsite and offsite with vehicles involved in construction and operation of Proposed Project, and damage to critical transport infrastructure caused by extreme weather i.e., periods of heavy rainfall, taking into account climate change and strong winds.

As detailed in Section 15.1 Traffic and Transport in Chapter 15 of this EIAR: Material Assets, the localised traffic disruptions as a result of other proposed works will be mitigated through the use of industry standard traffic management measures. These traffic management measures will be designed in accordance with the Department of Transport's '*Guidance for the Control and Management of Traffic at Roadworks – Second Edition (2010)*'.

Flooding

The Proposed Project is not located within an urban area; therefore, the urban flooding scenario is not applicable.

Chapter 9 and the accompanying Appendix 9-1 Flood Risk Assessment (FRA), detail the flood risk of the Proposed Project site. Based on the information provided in the stated documents, the areas of the Proposed Project at risk of flooding were identified.

Through an iterative process of flood modelling and the design of the infrastructure locations around the modelled flood zones, the layout of the Proposed Project has been optimized. The National Indicative Fluvial Flood Map does not map any flood zones within the Proposed Wind Farm. The closest mapped historic and recurring flood events are situated in the Barrow River catchment. The nearest flood incident is a recurring event mapped to be at the town of Oldleighlin, ~4km from the Proposed Wind Farm. No National Catchment-based Flood Risk Assessment and Management (CFRAM) flood zones are mapped along any of the local watercourses draining the Proposed Grid Connection Route. Therefore, the Proposed Project will have no impact on flood risk elsewhere in the locality and this is largely due to the avoidance of fluvial flood zones for all sensitive aspects of the Proposed Project infrastructure.

The overall risk of flooding posed at the Proposed Wind Farm is assessed to be very low, and the overall risk of flooding posed at the Proposed Grid Connection Route is assessed to be low. Please refer to the Chapter 9 Water of this EIAR for further details

Aircraft Collision/ Loss

The Proposed Project will not utilise air strips or aircraft for the delivery of turbine components. Delivery of turbines and their associated components will be via the national and local road network.

The Proposed Project has the potential to affect aviation due to the erection of manmade structure in excess of 45 metres that may constitute an obstacle to air navigation. These impacts are addressed in detail in Section 15.2 in Chapter 15 of this EIAR: Material Assets. The scoping response from the Irish Aviation Authority (IAA) set out that in the event of planning consent being granted, the applicant should be conditioned to contact the IAA to (1) agree an aeronautical obstacle warning light scheme for the wind development, (2) provide as-constructed coordinates in WGS84 format together with ground and blade tip height elevations at each wind turbine location and (3) notify the IAA of intention to commence crane operations with at least 30 days prior notification of their erection. The coordinates and elevations for built turbines will be supplied to the IAA, as is standard practice for wind farm developments.

Following the guidance above, consultation with the IAA and the Department of Defence (DoD) has been carried out by MKO as part of the assessment of the Proposed Project and are summarised in Section 15.2.4.3 of Chapter 15 of this EIAR.

Chapter 15 and the accompanying Appendix 15-6 Aviation Impact Assessment (AIA) provides a qualitative evaluation of the Proposed Wind Farm's potential to impact airspace, civil and military flight following the framework outlined in the Irish Air Corps 'Air Corps Wind Farm/Tall Structures Position Paper' in 2014 (hereafter referred to as the IAC Position Paper). Based on the information provided in the stated documents, the areas of the Proposed Project at posing a risk to aviation were identified.

The AIA identifies potential impacts on 4 no. identified receptors; Airspace, General Aviation, the Air Corps Activity within MOA3, and the Air Corps Activity within the 3NM from motorways. The airspace above the Proposed Wind Farm is a Special Use Airspace designated as MOA3, which requires awareness of the risk of its use at or below 1,370m above ground level (AGL) and cooperation with military air traffic control above that altitude. Regarding general aviation, the Proposed Wind Farm's maximum AGL of 180m is below the minimum height regulations required by aircraft in the area of 590m AGL. MOA3 is designated by the IAC for use in general flight and manoeuvring training.

The assessment identifies that airspace and civil and/or military aviation are not impacted to any degree that may be deemed unsafe or inconvenient to users. These receptors and the assessed impact of the Proposed Wind Farm on each is listed in Table 15-2 of Chapter 15 of this EIAR

Water Contamination

The Proposed Project has the potential to cause contamination and pollution of groundwater and surface water from potential release of hydrocarbons, earthworks and excavations on the Proposed Project site. These impacts are addressed in detail in the Chapter 9 of this EIAR: Water and are not related to either the vulnerability of the Proposed Project to natural disasters or major accidents nor the potential for the Proposed Project to cause natural disasters or accidents.

There is potential for hazardous materials in the form of hydrocarbons to be transported to and used on the Proposed Project. Mitigation measures as best practise as detailed in Chapter 9 Water and the Construction and Environmental Management Plan (CEMP) (Appendix 4-4), respectively, will minimise the potential for leaks and will break the potential pathways between any source and receptor therefore resulting in no residual effects. The removal of hazardous materials will be done so by licenced operators for disposal at licensed waste facilities. There will be no potential for hazardous material release during the operational phase of the Proposed Project.

The release of wastewater in relation to the Proposed Project can pose a risk to down gradient groundwater wells, groundwater quality and surface water quality. Proven and effective methods to mitigate against these potential impacts have been outlined above which will break the potential pathways between any source and receptor therefore resulting in no residual effects. Indirect impacts associated with major accidents and/or natural disasters on contamination are considered further in Section 16.4.1.

Hazmat

The European Communities Control of Major Accident Hazards Involving Dangerous Substance Regulations, 2000, applies to sites where certain quantities of specified dangerous substances are present. These sites (SEVESO sites) are classified as upper tier and lower tier. At present, there are no SEVESO sites within County Carlow and 2 no. SEVESO sites within County Kilkenny. The 2 no. SEVESO sites within County Kilkenny have specific External Emergency Plans for each site which are reviewed and tested on a three-year cycle. The closest SEVSO site to the Proposed Project is the Grassland Fertilisers Yard in Co. Kilkenny, located approximately 7.8km to the northwest of the Proposed Project at its closets point (the termination of the Proposed Grid Connection Route at the existing Kilkenny 110kV substation). Given the separation distance, it is considered that neither the Proposed Project nor the SEVESO site have the opportunity to negatively impact the other.

Rail Accident

The Kildare to Waterford rail line runs approximately 6.6km to the east of the Proposed Wind Farm in a general north to south orientation. The Proposed Project does not physically interact with the railway infrastructure.

The Limerick-to-Dublin rail line runs approximately 33.6km northwest of the Proposed Wind Farm at its closest point in a northeast to southwest orientation. The Proposed Project will not physically interact with the railway infrastructure.

Works relating to the construction of the Proposed Project, which will be confined to a minimum 20m set back from the railway line, will not interfere with the track, track drainage or embankment. Nonetheless, during the construction phase, the requirements for third parties as set out in 'CCE Department Technical Guidance Document CCE-TMS-310 Guidance on Third Party Works' and 'CCE Departmental and Multidisciplinary Standard I-DEP-0121 Third Party Works: Additional Details of Railway Safety Requirements' will be adhered to. Furthermore, contact will be made to IEDR 30 days prior to the works that will take place at a minimum of 20m northwest of CIE infrastructure.

Industrial Fire / Explosion

The likelihood of fire or explosion occurring at the Proposed Project is anticipated to be low. The likelihood of fire or explosion occurring will be further lowered by the implementation of good site management practices during the construction, operational and decommissioning phases.

Loss of Critical Infrastructure

The Proposed Project will utilise the existing road network during the construction phase. Construction related traffic will originate from the delivery of materials to the Proposed Project and transport of employees to, from and throughout the Proposed Project.

It is proposed that large wind turbine components will be delivered to the Proposed Wind Farm under Garda escort.

Potential impacts that may occur on the identified road networks could be caused by an accident during the delivery of the turbines, collisions onsite and offsite with vehicles involved in construction and operation of Proposed Project, and damage to critical transport infrastructure caused by extreme weather i.e., periods of heavy rainfall, taking into account climate change and strong winds.

As detailed in Section 15.1 Traffic and Transport in Chapter 15 of this EIAR: Material Assets, the localised traffic disruptions as a result of other proposed works will be mitigated through the use of industry standard traffic management measures. These traffic management measures will be designed in

accordance with the Department of Transport's 'Guidance for the Control and Management of Traffic at Roadworks – Second Edition (2010)'.

In regards to telecoms and other signally infrastructure, the Proposed Project will have no impact as it will not physically interact with any of infrastructure of this nature.

Methane Explosion / Gas Explosion on Main Cork to Dublin Gas Line

The likelihood of a methane explosion occurring at the Proposed Project is anticipated to be low. The likelihood of a methane explosion occurring will be further lowered by the implementation of good site management practices during the construction, operational and decommissioning phases.

The Cork to Dublin Gas line runs from Cork to Waterford, Carlow, Kildare and terminates in Dublin. Offshoots of the line from Cork northwards into Carlow Town and Kilkenny City, which are located approximately 12km northeast and 17.6km southwest from the Proposed Wind Farm, respectively. As such, it is considered that neither the Proposed Project nor the gas line have the opportunity to negatively impact the other.

Bridge / Structural Collapse

Bridge or structural collapse in the surrounding areas of the Proposed Project may occur due to earthquake, extreme weather events, and/or vehicular collision due to driver negligence.

Due to the transport of abnormal loads, i.e., turbine components, there is potential for bridge and/or road infrastructure collapse during turbine delivery. This impact may be exacerbated by extreme weather i.e., severe wind storms and heavy precipitation resulting from climate change. As outlined in Chapter 11 of this EIAR, due to Ireland's latitudinal position, the probability of extreme weather events posing a threat to the built environment are low. However, in the circumstance of such a weather event occurring at the site of the Proposed Project during the operational phase, the measures set out in the HSE South-East (Area 5) Major Emergency Plan will be followed.

Having regard to public speed limits within the Proposed Wind Farm site, it is not predicted that any collision of vehicles and any infrastructure would result in significant damage/collapse.

The Proposed Project will utilise the existing road network during the construction phase. Construction related traffic will originate from the delivery of materials to the Proposed Project and transport of employees to, from and throughout the Proposed Project. It is proposed that large wind turbine components will be delivered to the Proposed Wind Farm under Garda escort.

Potential impacts that may occur on the identified road networks could be caused by an accident during the delivery of the turbines, collisions onsite and offsite with vehicles involved in construction and operation of Proposed Project, and damage to critical transport infrastructure and bridges, and structural collapse.

As detailed in Section 15.1 Traffic and Transport in Chapter 15 of this EIAR: Material Assets, the localised traffic disruptions as a result of other proposed works will be mitigated through the use of industry standard traffic management measures. These traffic management measures will be designed in accordance with the Department of Transport's 'Guidance for the Control and Management of Traffic at Roadworks – Second Edition (2010)'.

As detailed in Section 4.4.3 in Chapter 4 of this EIAR, a preliminary structural assessment on the Black Bridge, located on the L1835 and L3037, has been conducted by Jennings O'Donovan & Partners Limited which is included as Appendix 4-6 of this EIAR, 'Bridge Crossing Structural Assessment Report'. The findings of the report indicate that there will be permanent carriageway strengthening works required at the Black Bridge, which crosses the River Dinn at the Kilkenny and Carlow County

boundary on L1835 and L3037, to facilitate delivery of abnormal loads i.e., turbine components. The upgrade works include for provision of a new reinforcing concrete slab on the existing black bridge stone arch, and road surface dressing. The carriageway strengthening works on the Black Bridge forms part of the planning application being made to Carlow County Council and Kilkenny County Council.

As detailed in Section 4.8.8.4 in Chapter 4 of this EIAR, the underground Proposed Grid Connection Route will involve 7 No. bridge crossings, all of which will involve Horizontal Directional Drilling (HDD). HDD is a method of drilling under obstacles such as bridges, railways, water courses, etc. in order to install cable ducts under the obstacle. The HDD methodology is outlined in detail in Section 5 of both reports included in Appendix 4-7 of the EIAR.

As detailed above, the avoidance of bridges or structural collapse, and structural reinforcement of bridge infrastructure has been a key consideration of the Proposed Project design. The likelihood of bridge/structural collapse will be further lowered by the implementation of good site management practices during the construction, operational and decommissioning phases.

16.4

Risk Assessment

This section outlines the possible risks associated with the Proposed Project for the construction, operational and decommissioning phases.

These risks have been assessed in accordance with the relevant classification as outlined in Table 16-1 and 16-2.

As outlined in Section 16.2.4.2.2, the consequence rating assigned to each potential risk assumes that all proposed mitigation measures and safety procedures have failed to prevent the major accident and/or disaster i.e., pre-mitigation.

16.4.1

Likely Significant Effects

16.4.1.1

Do-Nothing Scenario

If the Proposed Project were not to proceed, the existing use of the Proposed Wind Farm for small-scale agricultural farming practices and forestry would continue, and public road corridor along the Proposed Grid Connection Route.

If the Proposed Project were not to proceed, the opportunity to capture a significant part of County Carlow's and Ireland's valuable renewable energy resource would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment and investment and to diversify the local economy would also be lost.

16.4.1.2

Identification of Effects During Construction

A risk register has been developed which contains all potentially relevant risks identified during the construction phase of the Proposed Project. Seven risks specific to the construction of the Proposed Project have been identified and are presented in Table 16-4.

Table 16-4 Risk Register - Construction Phase

Risk ID	Potential Risk	Possible Cause
Potential vulnerability to disaster risks		
A	Critical Infrastructure Emergencies Risk of delivery of turbines and infrastructure to site.	Traffic accident during turbine delivery or extreme weather periods of heavy rainfall, taking into account climate change and strong winds
B	Severe Weather Risk to construction activity on site	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds
C	Flooding Risk of flooding in areas surrounding the Proposed Project impacting the construction phase and leading to environmental emissions	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds
Potential to cause accidents and / or disasters.		
D	Utility emergencies Risk of construction activity along the Proposed Grid Connection Route.	Construction activity along Proposed Grid Connection Route and road network impacting on local services and utilities
E	Traffic Incident Collisions onsite and offsite with vehicles involved in construction of Proposed Project.	Driver negligence or failure of vehicular operations on Proposed Project roads (Proposed Wind Farm access roads and public road network in which Proposed Grid Connection Route is proposed). Traffic Management not implemented
F	Contamination Discharge or spillage of fuel, chemical solvents into watercourse or percolated to groundwater. Discharge due to horizontal directional drilling (HDD) frack out on Proposed Grid Connection Route works area.	Accidental fuel spillage during delivery to site. Failure of fuel storage tank or tanks in plant and machinery and vehicles leading to uncontrolled emissions. Drainage and seepage water resulting from accident during infrastructure excavation; Stockpiled excavated material becoming unstable and providing a point source of exposed sediment; Excavation works during the construction of the Proposed Project which may result

		in entrainment of sediment from the excavations during construction; and, Frack Out associated with HDD along Proposed Grid Connection Route underground electrical cabling route which may result in sediment release to surface water.
G	Fire / Gas Explosion	Equipment or infrastructure failure; Electrical problems; and Employee negligence.
H	Collapse / damage to structures	Earthquake, land slide, extreme weather events; and Vehicular collisions due to driver negligence on public roads. Traffic Management not implemented

16.4.1.3 Identification of Effect During Operation

Six risks specific to the operation of the Proposed Project have been identified and are presented in Table 16-5.

Table 16-5 Risk Register – Operational Phase

Risk ID	Potential Risk	Possible Cause
Potential vulnerability to disaster risks		
I	Severe Weather Risk to operational activity on site, blade or turbine damage	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds.
J	Flooding Risk of flooding in areas surrounding the Proposed Project impacting the construction phase and leading to environmental emissions	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds
K	Contamination Discharge or spillage of fuel, chemical solvents, sewage or wastewater into watercourse or percolated to groundwater	A vehicular incident on the public road involving fuel, wastewater or sewage transportation in the operational phase. Spill or leak of oil during operational maintenance.

L	Fire / Gas Explosion	Equipment or infrastructure failure; Electrical problems; and Employee negligence.
Potential to cause accidents and / or disasters.		
M	Collapse / damage to structures	Earthquake, land slide, extreme weather events; and Vehicular collisions due to driver negligence on public roads.
N	Traffic Incident Collisions onsite and offsite with vehicles involved in operation of Proposed Project.	Driver negligence or failure of vehicular operations on Proposed Wind Farm roads. Traffic Management not implemented

16.4.1.4 Identification of Effect During Decommissioning

Four risks specific to the decommissioning of the Proposed Project have been identified and are presented in Table 16-6.

Table 16-6 Risk Register – Decommissioning Phase

Risk ID	Potential Risk	Possible Cause
Potential vulnerability to disaster risks		
O	Severe Weather Risk to decommissioning activity on the Proposed Project leading to environmental emissions	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds.
P	Flooding Risk of flooding in areas surrounding the Proposed Project impacting the decommissioning phase and leading to environmental emissions	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds.
Potential to cause accidents and / or disasters.		
Q	Traffic Incident Collisions onsite and offsite with vehicles involved in construction of Proposed Project.	Driver negligence or failure of vehicular operations on Proposed Wind Farm roads. Traffic Management not implemented.
R	Contamination	Accidental fuel spillage during delivery to the Proposed Project.

	Discharge or spillage of fuel, chemical solvents into watercourse or percolated to groundwater	Failure of fuel storage tank or tanks in plant and machinery and vehicles leading to uncontrolled emissions.
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These risks have been assessed in accordance with the relevant classification (Refer to Table 16-1 and Table 16-2) and the resulting risk analysis is given in Table 16-7.

The risk register is based upon possible risks associated the Proposed Project. As outlined in Section 16.2.4.2.2, the consequence rating assigned to each potential risk assumes that all proposed mitigation measures and safety procedures have failed to prevent the major accident and/or disaster.

16.4.1.5 Assessment of Effect – Summary

Table 16-7 Risk Assessment

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
Construction Phase								
A	Critical Infrastructure Emergencies	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds	Illness or loss of life;	2	The risk of traffic accident during turbine delivery and severe weather conditions impacting the identified road network is very unlikely when considering the assessment in Chapter 11 Climate (weather conditions recorded over the last 30 years within the area) and Chapter 15.1 – Traffic Assessment (turbine delivery occurring during the night, Garda patrolled, etc)	1	The risk of a traffic accident due to severe weather conditions during the construction phase will result in a minor consequence in that ‘small number of people would be affected’ should a severe weather occur, with ‘no fatalities and a small number of minor injuries with first aid treatment’.	2
B	Severe Weather	Extreme weather- periods of heavy rainfall, taking into account climate change	Illness or loss of life; Damage to, or depletion of aquatic habitats and species;	2	The risk of severe weather is very unlikely when considering the assessment in Chapter 11 and weather conditions recorded over the last 30 years within the area. The works programme for the groundworks part of the	1	The risk of severe weather conditions during the construction phase will result in a minor consequence in that ‘small number of people would be affected’ should a severe weather occur,	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		and strong winds			construction phase of the Proposed Project will take account of weather forecasts and predicted rainfall in particular and construction will be paused if required.		with 'no fatalities and a small number of minor injuries with first aid treatment'. Severe weather may cause increased mobilisation of sediment which will be controlled via the Proposed Project design and mitigation measures.	
C	Flooding	Extreme weather-periods of heavy rainfall, taking into account climate change and strong winds	Illness or loss of life; Groundwater Flooding Flooding to surrounding properties. Damage to, or depletion of aquatic habitats and species;	2	As detailed in Appendix 9-1, a flood risk identification study was undertaken to identify existing potential flood risks associated with the Proposed Project. In relation to the Proposed Wind Farm, the closest mapped historic and recurring flood events are situated in the Barrow River catchment. The nearest flood incident is a recurring event mapped to be at the town of Oldleighlin, ~4km from the Proposed Wind Farm (ID: 2598). No Proposed Project infrastructure within the site is	1	The risk of flooding during the construction phase will result in a minor consequence in that 'small number of people would be affected' should a severe weather occur, with 'no fatalities and a small number of minor injuries with first aid treatment'. Flooding has the potential to cause increased sediment mobilisation however flooding is not	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
					proposed in the River Barrow surface water catchment, and the Proposed Project is also not mapped within any OPW/CFRAM flood zones.		anticipated and should any flooding occur, it would be localised.	
D	Utility emergencies	Construction activity along road network during the Proposed Grid Connection Route installation impacting on local services and utilities	Illness or loss of life; Disruption to services	2	Confirmatory surveys will be carried out by the Contractor to ensure that the Proposed Grid Connection Route is designed to take into consideration any services and utilities with the road network. As such the risk of a utility emergency occurring during the construction of the Proposed Grid Connection Route is considered very unlikely.	1	The risk of impact on utilities and services during the construction phase will result in a minor consequence in that 'small number of people would be affected, with 'no fatalities and a small number of minor injuries with first aid treatment'.	2
E	Traffic Incident	Driver negligence or failure of vehicular operations on the Proposed Project roads (Proposed Wind Farm	Injury or loss of life.	3	Construction vehicles, HGVs and staff vehicles will be present within the Proposed Project during the construction phase. They will utilise existing third-party forestry tracks and the public road network and will therefore interact with local road users.	1	A minor consequence is predicted. Having regard to on-site speed limits and vehicular movements, a 'small number of people would be affected' should a vehicular collision occur, with 'no fatalities and small number of	3

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		access roads and public road network in which Proposed Grid Connection Route is proposed). Traffic Management not implemented			As such, it can be determined that there is some 'opportunity, reason or means' for a vehicle collision during the construction of the Proposed Project, 'at some time.' Throughout the construction phase, traffic management measures will be implemented as outlined in the Traffic Management Plan (Appendix 15-2). An unlikely risk is therefore predicted.		minor injuries with first aid treatment.'	
F	Contamination – Fuel storage and handling -General Construction	Fuel spillage during delivery to the Proposed Project. Failure of fuel storage tank or tanks in plant and machinery and vehicles. Drainage and seepage water	Release of suspended solids to groundwater. Contamination of local drinking water supplies and groundwater aquifers. Groundwater and surface water	2	As outlined in Chapter 4, fuel will be stored onsite at the Proposed Wind Farm but in a bunded area to ensure containment and prevent spillages of fuel. No fuels, chemicals or solvents will be stored outside of the confines of the Proposed Wind Farm. Setback distances from sensitive hydrological features means that adequate room is maintained for the proposed drainage mitigation measures as detailed in Chapter 9.	2	The risk of a fuel spillage or impact on surround drainage during the construction will result in a limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration' on environmental receptors through the use of bunded containment areas during construction.	4

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		<p>resulting from infrastructure excavation.</p> <p>Stockpiled excavated material providing a point source of exposed sediment.</p> <p>Works during the construction of the Proposed Project which may result in entrainment of sediment from the excavations or HDD.</p>	emissions from construction activities including trench excavations and HDD (frack out)		Detailed mitigation measures and methodologies for the control of emissions from Proposed Grid Connection Route works as described in the EIAR. Standard and specific mitigation to prevent accidents and indirect effects of accidents are included in the Proposed Project design and will be implemented.		<p>The Proposed Grid Connection Route is located in the existing road network which is of low value environmental receptor.</p> <p>Horizontal Directional Drilling (HDD) is planned for a limited number of locations and will be controlled to prevent significant environmental effects should frack out occur.</p> <p>The potential residual environmental effects are described in detail in Chapter 8 which concludes that there will be no significant environmental effects.</p>	
G	Fire / Gas Explosion	Equipment or infrastructure failure;	Illness or loss of life;	2	As outlined in Chapter 4, fuel will be stored on-the Proposed Wind Farm but in a bunded area to ensure containment and prevent	2	Should a fire/explosion occur at the Proposed Project, a limited consequence in that there	4

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		Fuel spillage/ storage Electrical problems; and Employee negligence	Damage to, or depletion of habitats and species; and Impacts on ambient air quality.		<p>spillages of fuel. No fuels, chemicals or solvents will be stored outside of the confines of the site.</p> <p>In accordance with Chapter 19 of the Safety, Health and Welfare at Work Act 2005 (the 2005 Act), the Proposed Project shall be subject to a fire safety risk assessment which would assist in the identification of any major risks of fire on site, and mitigation of the same during operation.</p>		<p>would be ‘a limited number of people affected’ with ‘localised effects of short duration’ on people and environmental receptors due to the nature of the Proposed Project and the lack of infrastructure or fuel storage during operation that would result in any such incident.</p> <p>There will be ‘normal community functioning’ in the area with ‘some inconvenience’ The ‘generic command, control & co-ordination systems’ as well as the ‘common elements of response’ detailed in the Carlow and Kilkenny County Council Major Emergency Plans will work to reduce the consequence (both on people and the</p>	

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
							environment) of potential fire/explosions at the Proposed Project.	
H	Collapse/damage to structures	<p>Earthquakes, extreme weather events; and</p> <p>Vehicular collisions due to driver negligence on public roads.</p>	Injury or loss of life.	1	<p>According to the Irish National Seismic Network (INSN), earthquakes measuring ~2 on the Richter Scale are “normal” in terms of seismicity in Ireland. These are known as microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. As such, buildings in Ireland are extremely unlikely to be damaged or collapse due to seismic activity.</p> <p>Due to the transport of abnormal loads, i.e., turbine components, there is potential for bridge and/or road infrastructure collapse during turbine delivery. This impact may be exacerbated by extreme weather i.e., severe wind storms and heavy precipitation resulting from climate change.</p>	2	The risk of infrastructure collapse during the operational phase will result in a limited consequence in that ‘a limited number of people affected’ with ‘localised effects of short duration’ on people and environmental receptors due to the nature of the Proposed Project.	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
					<p>The Proposed Project will utilise the existing road network during the construction phase. It is proposed that large wind turbine components will be delivered to the Proposed Wind Farm under Garda escort.</p> <p>Having regard to public speed limits within the surrounding area of the Proposed Project, it is not predicted that any collision of vehicles and any infrastructure would result in significant damage/collapse.</p> <p>The avoidance of bridges or structural collapse, and structural reinforcement of bridge infrastructure has been a key consideration of the Proposed Project design.</p>			
Operational Phase								
I	Severe Weather	Extreme weather-periods of	Illness or loss of life;	2	The risk of severe weather is very unlikely when considering the assessment in Chapter 11 and	1	The risk of severe weather conditions during the decommissioning	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		heavy rainfall, taking into account climate change and strong winds			weather conditions recorded over the last 30 years within the area.		phase will result in a minor consequence in that 'small number of people would be affected' should a severe weather occur, with 'no fatalities and a small number of minor injuries with first aid treatment'.	
J	Flooding	Extreme weather-periods of heavy rainfall, taking into account climate change and strong winds	Illness or loss of life; Groundwater Flooding Flooding to surrounding properties Damage to, or depletion of aquatic habitats and species;	2	As detailed in Appendix 9-1, a flood risk identification study was undertaken to identify existing potential flood risks associated with the Proposed Project. In relation to the Proposed Wind Farm, the closest mapped historic and recurring flood events are situated in the Barrow River catchment. The nearest flood incident is a recurring event mapped to be at the town of Oldleighlin, ~4km from the Proposed Wind Farm (ID: 2598). No Proposed Project infrastructure within the site is proposed in the River Barrow surface water catchment, and the Proposed Wind Farm is also not	1	The risk of flooding during the construction phase will result in a minor consequence in that 'small number of people would be affected' should a severe weather occur, with 'no fatalities and a small number of minor injuries with first aid treatment'. Flooding has the potential to cause increased sediment mobilisation however flooding is not anticipated and should any flooding occur, it would be localised.	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
					mapped within the OPW/CFRAM flood zones.			
K	Contamination	A vehicular incident on the public road or Proposed Wind Farm internal road network involving fuel, wastewater or sewage transportation in the operational phase.	Damage to, or depletion of aquatic habitats and species Contamination of local drinking water supplies and groundwater aquifers.	2	As outlined in Chapter 4, fuel will not be stored on-site post construction therefore contamination caused by fuel stored on site is not considered to be a significant contamination risk. However, due to the presence of maintenance and monitoring vehicles, fuel leakage from onsite vehicle during the operational phase may occur. As such the likelihood of fuel leakages occurring is very unlikely.	2	The risk of a fuel spillage or impact on surround drainage during the operational stage will result in a limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration' through the use of bunded containment areas during operation. The potential residual environmental effects are described in detail in Chapter 8 which concludes that there will be no significant environmental effects.	4
L	Fire / Gas Explosion	Equipment or infrastructure failure;	Illness or loss of life; Damage to, or depletion of	2	As outlined in Chapter 4, fuel will not be stored on-site post construction therefore fuel is not considered to be a significant fire risk.	2	Should a fire/explosion occur at the Proposed Project, a limited consequence in that there would be 'a limited	4

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		Fuel spillage/ storage Electrical problems; and Employee negligence	habitats and species; and Impacts on ambient air quality.		In accordance with Chapter 19 of the Safety, Health and Welfare at Work Act 2005 (the 2005 Act), the Proposed Project shall be subject to a fire safety risk assessment which would assist in the identification of any major risks of fire on-site, and mitigation of the same during operation.		number of people affected' with 'localised effects of short duration' on people and environmental receptors due to the nature of the Proposed Project and the lack of infrastructure or fuel storage during operation that would result in any such incident. There will be 'normal community functioning' in the area with 'some inconvenience' The 'generic command, control & co-ordination systems' as well as the 'common elements of response' detailed in the Carlow and Kilkenny County Council Major Emergency Plans will work to reduce the consequence (both on people and the environment) of potential	

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
							fire/explosions at the Proposed Project site.	
M	Collapse/ damage to structures	<p>Earthquakes, extreme weather events; and</p> <p>Vehicular collisions due to driver negligence on public roads.</p>	Injury or loss of life.	1	<p>According to the Irish National Seismic Network (INSN), earthquakes measuring ~2 on the Richter Scale are “normal” in terms of seismicity in Ireland. These are known as microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. As such, buildings in Ireland are extremely unlikely to be damaged or collapse due to seismic activity.</p> <p>Having regard to public speed limits within the Proposed Wind Farm, it is not predicted that any collision of vehicles and any infrastructure would result in significant damage/collapse.</p> <p>As outlined in Chapter 11 of this EIAR, due to Ireland’s latitudinal position, the probability of extreme weather events posing a threat to the built environment are</p>	2	The risk of infrastructure collapse during the operational phase will result in a limited consequence in that ‘a limited number of people affected’ with ‘localised effects of short duration’ on people and environmental receptors due to the nature of the Proposed Project.	1

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
					<p>low. However, in the circumstance of such a weather event occurring at the site of the Proposed Project during the operational phase, the measures set out in the HSE South-East (Area 5) Major Emergency Plan will be followed.</p> <p>Having regard to public speed limits within the Proposed Wind Farm site, it is not predicted that any collision of vehicles and any infrastructure would result in significant damage/collapse.</p>			
N	Traffic Incident	<p>Driver negligence or failure of vehicular operations on the Proposed Wind Farm roads.</p> <p>Traffic Management not implemented</p>	Injury or loss of life.	3	<p>Construction vehicles, HGVs and staff vehicles will be present within and around the Proposed Project during the construction phase. They will access the Proposed Wind Farm via the public road network and will therefore interact with local road users.</p> <p>As such, it can be determined that there is some 'opportunity, reason or means' for a vehicle collision</p>	1	A minor consequence is predicted. Having regard to on-site speed limits and vehicular movements, a 'small number of people would be affected' should a vehicular collision occur, with 'no fatalities and small number of minor injuries with first aid treatment.'	3

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
					during the construction of the Proposed Project, 'at some time.' Throughout the construction phase, traffic management measures will be implemented as outlined in the Traffic Management Plan (Appendix 15-2). An unlikely risk is therefore predicted.			
Decommissioning Phase								
O	Severe Weather	Extreme weather-periods of heavy rainfall, taking into account climate change and strong winds	Illness or loss of life; Damage to, or depletion of aquatic habitats and species;	2	The risk of severe weather is very unlikely when considering the assessment in Chapter 11 and weather conditions recorded over the last 30 years within the area. Decommissioning works will be paused should a Status Red weather warning alert be issued by Met Eireann as is standard practice	1	The risk of severe weather conditions during the decommissioning phase will result in a minor consequence in that 'small number of people would be affected' should a severe weather occur, with 'no fatalities and a small number of minor injuries with first aid treatment'. Decommissioning will not require significant excavations works. There is no real likelihood of	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
							any impact on any environmental receptors	
P	Flooding	Extreme weather-periods of heavy rainfall, taking into account climate change and strong winds	Illness or loss of life; Groundwater Flooding Flooding to surrounding properties Damage to, or depletion of aquatic habitats and species;	2	As detailed in Appendix 9-1, a flood risk identification study was undertaken to identify existing potential flood risks associated with the Proposed Project. In relation to the Proposed Wind Farm, the closest mapped historic and recurring flood events are situated in the Barrow River catchment. The nearest flood incident is a recurring event mapped to be at the town of Oldleighlin, ~4km from the Proposed Wind Farm (ID: 2598). No Proposed Project infrastructure within site is proposed in the River Barrow surface water catchment, and the Proposed Wind Farm is also not mapped within the OPW/CFRAM flood zones.	1	The risk of flooding during the construction phase will result in a minor consequence in that 'small number of people would be affected' should a severe weather occur, with 'no fatalities and a small number of minor injuries with first aid treatment'. Flooding has the potential to cause increased sediment mobilisation however flooding is not anticipated and should any flooding occur, it would be localised.	2
Q	Traffic Incident	Driver negligence or failure of vehicular	Injury or loss of life.	3	A limited number of vehicles will be permitted on the Proposed Project as part of the decommissioning phase.	1	A minor consequence is predicted. Having regard to on-site speed limits and vehicular movements, a	3

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		operations on the Proposed Wind Farm roads. Traffic Management not implemented			As such, it can be determined that there is some 'opportunity, reason or means' for a vehicle collision to occur on the Proposed Project site, 'at some time.' An unlikely risk is therefore predicted.		'small number of people would be affected' should a vehicular collision occur, with 'no fatalities and small number of minor injuries with first aid treatment.'	
R	Contamination	Fuel spillage during delivery to the Proposed Project. Failure of fuel storage tank or tanks in plant and machinery and vehicles.	Damage to, or depletion of aquatic habitats and species Discharge to groundwater	2	As outlined in Chapter 4, fuel will be stored on-the Proposed Project but in a bunded area to ensure containment and prevent spillages of fuel. No fuels, chemicals or solvents will be stored outside of the confines of the site. Setback distances from sensitive hydrological features means that adequate room is maintained for the proposed drainage measures as detailed in Chapter 9	2	The risk of a fuel spillage or impact on surrounding drainage during decommissioning will result in a limited consequence where 'a limited number of people affected' with 'localised effects of short duration' through the use of bunded containment areas during decommissioning. The potential residual environmental effects are described in detail in Chapter 9 which concludes that there will be no significant environmental effects.	4

The risk assessment for each of the potential risks identified are consolidated in Table 16-8 which provides their 'risk score.' A corresponding risk matrix is provided in Table 16-9, which is colour coded in order to provide an indication of the critical nature of each risk. As outlined in Section 16.2.4.2, the red zone represents 'high risk' scenarios, the amber zone represents 'medium risk scenarios' and the green zone represents 'low risk' scenarios.

Table 16-8 Risk Scores

Risk ID	Potential Risk	Likelihood Rating	Consequence Rating	Risk Score
Construction Phase				
A	Critical Infrastructure Emergencies	2	1	2
B	Severe Weather	2	1	2
C	Flooding	2	1	2
D	Utility company emergencies	2	1	2
E	Traffic Incident	3	1	3
F	Contamination	2	2	4
G	Fire / Gas Explosion	2	2	4
H	Collapse/ damage to structures	1	2	2
Operational Phase				
I	Severe Weather	2	1	2
J	Flooding	2	1	2
K	Contamination	2	2	4
L	Fire / Gas Explosion	2	2	4
M	Collapse/ damage to structures	1	2	2
N	Traffic Incident	3	1	3
Decommissioning Phase				
O	Severe Weather	2	1	2
P	Flooding	2	1	2
Q	Traffic Incident	3	1	3
R	Contamination	2	2	4

Table 16-9 Risk Matrix

		Consequence Rating				
		1.Minor	2.Limited	3. Serious	4.Very Serious	5.Catastrophic
Likelihood Rating	5.Very Likely					
	4. Likely					
	3. Unlikely	E, N, Q				
	2. Very Unlikely	A, B, C, D, H, I, M, O	F, G, J, K, L, P, R			
	1. Extremely Unlikely					

Table 16-9 presents the potential risks identified during the construction, operation and decommissioning of the Proposed Project all of which can be classified as 'low risk' scenarios.

The scenario with the highest risk score in terms of a major accident and/or natural disaster during the construction, operation and decommissioning phase of the Proposed Project is identified below.

16.4.1.6 Contamination During Construction, Operation and Decommissioning

There is a potential risk of contamination from Proposed Project site activities during the construction, operational and decommissioning phases from potential release of hydrocarbons. The risk of contamination was given a risk score of 4 on a very precautionary basis. However, as outlined in Chapter 8, Section 8.6 and Chapter 9, Section 9.5.2.6, measures will be put in place to reduce the risk of accidental spillage and contamination of pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology.

The risk of contamination is 'very unlikely' to occur and will have 'limited' consequences should it do so, representing a 'low-risk scenario' during the construction and decommissioning phases.

The conclusions in the relevant chapters of the EIAR conclude that there will be no significant residual effects associated with this potential impact.

16.4.1.7 Fire/Explosion During Construction, Operation and Decommissioning

There is a potential risk of fire/explosion at the Proposed Project. However, as outlined in Section 16.2.1, the scope of this assessment has been based on the understanding that the Proposed Project will be designed, built and operated in line with current best practice. Further, in accordance with Chapter 19 of the Safety, Health and Welfare at Work Acts 2005 to 2014, the Proposed Project shall be subject to a fire safety risk assessment which will assist in the identification of any major risks of fire on Proposed Project, and mitigation of the same during operation.

16.4.2 Mitigation Measures

As outlined in Section 16.4.1, the scenario with the highest risk score in terms of the occurrence of major accident and/or disaster during construction, operation and decommissioning was identified as 'Contamination' of the site and risk of 'Fire/Explosion' occurring at the Proposed Project.

The Proposed Project will be designed and built in line with current best practice and, as such, mitigation against the risk of major accidents and/or disasters will be embedded through the design. In accordance with the provision of the European Commission 'Guidance on the preparation of Environmental Impact Assessment Reports', a Risk Management Plan will be prepared and implemented at the Proposed Project to ensure an effective response to disasters or the risk of accidents. The plan will include sufficient preparedness and emergency planning measures.

16.4.2.1 Mitigation – Contamination During Construction, Operation and Decommissioning

Potential effects associated with contamination during construction, operation and decommissioning are addressed fully in Chapter 8 Land, Soils and Geology, and Chapter 9 Water. The mitigation measures outlined in Chapter 9 to protect environmental receptors as well as the procedures and measures described in the Construction Environmental Management Plan (CEMP) will ensure that the risk from these sources is low.

A CEMP has been prepared for the Proposed Project and is included in Appendix 4-4 of this EIAR. Upon a grant of planning permission for the Proposed Project, the CEMP will be updated to reflect the conditions stipulated in the consent prior to the commencement of the development. The CEMP will be a live document maintained by the contractor that will work to ensure that potential risks of major accident and/or disaster are identified, avoided and mitigated, as necessary. Refer to Appendix 4-4 for the CEMP that sets out the minimum standards to be employed by the contractor.

All mitigation measures proposed as part of this project are also listed in Chapter 18: Schedule of Mitigation.

16.4.2.2 Mitigation – Fire/Explosion During Construction, Operation and Decommissioning

The Proposed Project will also be subject to a fire safety risk assessment in accordance with Chapter 19 of the Safety, Health and Welfare at Work Acts 2005 to 2014, which will assist in the identification of any major risks of fire on the Proposed Project, and mitigation of the same during operation.

As outlined in Section 4.7.10 of the EIAR, a detailed CEMP will be prepared prior to the commencement of any works. The CEMP will be a live document maintained by the contractor that will work to ensure that potential risks of major accident and/or disaster are identified, avoided and mitigated, as necessary. Refer to Appendix 4-4 for the CEMP that sets out the minimum standards to be employed by the contractor.

All mitigation measures proposed as part of this project are also listed in Chapter 18: Schedule of Mitigation.

16.4.3 Residual Effects

The risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low' in accordance with the '*Guide to Risk Assessment in Major Emergency Management*' (DoEHLG, 2010).

It is considered that when the above mitigation is implemented, and all mitigation detailed in the EIAR is implemented, there will not be significant residual effect(s) associated with the construction, operation and decommissioning of the Proposed Project.

16.4.4 Monitoring

Please refer to Chapter 18 Schedule of Mitigation and Monitoring Measures which details all proposed mitigation and monitoring measures for the construction, operation and decommissioning of the Proposed Project.

16.4.4.1 Monitoring During Construction

As outlined in Section 4.7.10 of the EIAR, a detailed CEMP will be prepared prior to the commencement of any works. The CEMP will be a live document maintained by the contractor that will work to ensure that potential risks of major accident and/or disaster are identified, avoided and mitigated, as necessary. Refer to Appendix 4-4 for the CEMP that sets out the minimum standards to be employed by the contractor.

16.4.4.2 Monitoring During Operation

The operator of the Proposed Project will continue to assess the risk of major accidents and/or disasters on the Proposed Project on an on-going basis during operation.

The maintenance programme, record of reported incidents, as well as general site activities will be monitored on an on-going basis to ensure risk of major accidents does not increase over time.

16.4.4.3 Monitoring During Decommissioning

As outlined in Section 4.10 of the EIAR, a Decommissioning Plan has been prepared (Appendix 4-8) the final detail of which will be agreed with the local authority prior to any decommissioning. The Decommissioning Plan will be updated prior to the end of the operational period in line with decommissioning methodologies that may exist at the time and will be agreed with the competent authority at that time. The Decommissioning Plan includes mitigation and monitoring measures that will be in place during the decommissioning phase. These can also be found in a Chapter 18 Schedule of Mitigation and Monitoring Measures which sets out all proposed Mitigation and Monitoring Measures for all three phases of the Proposed Project.

16.4.5 Impacts of Cumulative and In Combination Impacts

A search in relation to plans and projects that may have the potential to result in a cumulative impact with the Proposed Project on the environment was carried out as part of the EIAR. The Proposed Project has been considered, in combination with existing, permitted and proposed projects and plans (wind energy or otherwise), as set out in Section 2.9 in Chapter 2 of this EIAR, along with Appendix 2-3 of this EIAR.

Following a detailed assessment of the potential for any further impact when considered in combination with any or all of the plans and projects set out in Chapter 2, Section 2.9 and Appendix 2-3,

the Proposed Project, with mitigation measures in place, was found to have no potential for significant in-combination or cumulative effects associated with the potential for the project to be impacted by major accidents or natural disasters or the Proposed Project potential to cause major accidents or natural disasters. This is based on the low risk associated with the Proposed Project described in this Chapter of the EIAR and a review of the nature of the surrounding land uses and projects existing or intended in the surrounding area. Therefore, the cumulative residual effect of the Proposed Project to cause or be impacted by major accidents and natural disasters is not significant.