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 Development (Wind Farm Site and Grid Connection) as detailed in Chapter 4 to risks of major accidents and/or natural disasters, as well as the potential of the Proposed Development 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 Development to major accidents and natural disasters, as well as the risk of the Proposed Development itself causing accidents or disasters is carried out in compliance with the EIA Directive 2011/92/EU, as amended by 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 Development.

> *"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 Development could be vulnerable to;
- 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.

16.1.1 Statement of Authority

This section of the EIAR has been prepared by Shaun Doolin and reviewed by Eoin O'Sullivan, of MKO. Shaun was an Environmental Scientist with MKO from March 2021 to March 2024. Shaun holds an MSc (Hons) in Environmental Science and a BA (Hons) in General Science/Geography from Trinity College Dublin. Since joining MKO, Shaun has been involved in a range of large-scale onshore wind farm developments. Eoin O'Sullivan is Project Director Environment at MKO with over 14 years of experience in the assessment of a wide range of energy and infrastructure related projects and working in the fields of environmental and human health risk assessment, waste management, waste policy and permitting. Eoin holds a BSc (Hons) in Environmental Science & Technology and a MSc in Environmental Engineering. Eoin is a Chartered Member of the Chartered Institute of Water and Environmental Management and Chartered Environmentalist with the Society of Environment.

16.2 Assessment Methodology

Major accidents or natural disasters are hazards which have the potential to affect the Proposed Development and lead to environmental effects directly and indirectly. These include accidents during construction, operation and decommissioning of the Proposed Development caused by operational failure and/or natural hazards. The assessment of the risk of major accidents and/or 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 and climate and material assets, cultural heritage and the landscape. This is addressed through determining the legislative context, categorising the baseline environment, and determining a methodology for the impact assessment of the vulnerability of the Proposed Development to risks of major accidents and/or natural disasters, as well as the potential of the Proposed Development itself to cause potential major accidents and/or natural disasters.

16.2.1 Legislative Context

16.2.1.1 Legislation

An assessment of the following key elements was undertaken in accordance with the EIA Directive 2011/92/EU, as amended by 2014/52/EU:

- The vulnerability of the Proposed Development to potential accidents and disasters.
- The Proposed Development's 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 paragraph 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".*

16.2.1.2 Guidance Documents

The below guidance documents have been followed in the preparation of this chapter:

- 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 Protect Agency (2014) *Guidance on Assessing and Costing Environmental Liabilities.*
- Department of Defence (2020) *A National Risk Assessment for Ireland.*
- *HSE Emergency Management: Area 3 Crisis Management Team Major Emergency Plan (Covering Geographical Areas of Counties Clare, Limerick and North Tipperary) May 2022.*

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

- Census of Ireland 2016 and 2022;
- Regional Spatial and Economic Strategy (RSES) 2020-2032, published by the Southern Regional Assembly on 31st January 2020;
- Clare County Development Plan 2023 – 2029; and
- Clare County Council Website, Limerick City & County Council Website, Tipperary County Council Website.

This data 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.

16.2.3 Impact Assessment Methodology

16.2.3.1 Introduction

A wind farm is not a recognised source of pollution. It is not subject to Industrial Emissions Directive regulation or any other EPA 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 Development and causing environmental damage.

There is low potential for significant natural disasters to occur at the Proposed Development. 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 Development 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 Development has low potential to cause natural disasters or major accidents. As detailed in the Geotechnical and Peat Stability Report included in Appendix 8-1, the ground conditions on the Proposed Development site comprises mainly of shallow peat overlying clay and gravel overlying bedrock. The surrounding landscape to the south and north is predominately rolling topography with land-use comprising forestry and blanket peatland. Peat depths recorded ranged from 0.0 to 4m with an average depth of 0.55m. 97% of the probes recorded peat depths of less than 2m. The average peat depth at any of the proposed turbine locations is 0.4m. The findings of the peat stability assessment showed that the Proposed Development has an acceptable margin of safety, is suitable for the proposed wind farm development and is considered to be at low risk of peat failure provided appropriate mitigation measures, such as implementing and maintaining an appropriate drainage system are implemented. The proposed underground electrical cabling route is located predominantly within the

public road network. According to GSI mapping the soil types along the proposed Grid Connection route include sandstone till, alluvium, shale till, bedrock outcrops and embankment.

Any risks associated with flooding, impacts on infrastructure, accidents etc are addressed in the Section 16.4 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 below and in the relevant EIAR assessment chapters (Refer to Chapters 5 to 15 for further detail).

16.2.3.2 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 Development. The approach to identifying and quantifying risks associated with the Proposed Development by means of a site-specific risk assessment is derived from the EPA '*Guidance on Assessing and Costing Environmental Liabilities'* document[1]. The following steps were taken as part of the site-specific risk assessment:

- Risk identification
- Risk classification, likelihood and consequence; and
- Risk evaluation

16.2.3.2.1 *Risk Identification*

Risks have been reviewed through the identification of reasonably foreseeable risks in consultation with relevant contributors to this EIAR (refer to *Statements of Authority* in Chapters 5 to 15 of this EIAR). The identification of risks has focused on non-standard but plausible incidents that could occur at or as a result of the Proposed Development during construction, operation and decommissioning.

In accordance with the European Commission EIAR Guidance[2], risks are identified in respect of the Proposed Development:

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

16.2.3.2.2 *Risk Classification*

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.

[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*
[2] *European Commission (2017). Environmental Impact Assessment of Projects – Guidance on the preparation of Environmental Impact Assessment Reports*

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

Ranking	Classification	Likelihood
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 *HSE Emergency Management: Area 3 Crisis Management Team Major Emergency Plan* 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, which is used to position all the identified hazards on the risk matrix described below.

The consequence of a risk to/from the Proposed Development 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	Classification	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).

Ranking	Classification	Impact	Description
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 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

Ranking	Classification	Impact	Description
			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 rankings have been multiplied to establish a 'risk score' to support the evaluation of risks within the Risk Matrix Zone.

The Risk Matrix Zone 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 Zone has therefore been applied to evaluate each of the risks associated with the Proposed Development. The Risk Matrix Zone 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: Risk Matrix Zone (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					

16.3 Proposed Development Hazard Analysis

The *HSE Emergency Management: Area 3 Crisis Management Team Major Emergency Plan* outlines several hazard categories which may have the potential to lead to a major emergency in Area 3 – Clare, Limerick and North Tipperary. The hazard categories include Natural, Transportation, Technological and Civil. The hazard categories, types and subtypes, and their relevance to the Proposed Development during all stages (i.e., construction, operation and decommissioning stage), prior to the implementation of mitigation measures, are listed below in Table 16-4.

Table 16-4 HSE Emergency Plan hazard identification (Area 3 Crisis Management Team Major Emergency Plan)

Natural Hazards			
Category	**Type**	**Subtype**	**Relevant Hazard to the Proposed Development**
Meteorological	Storm / Gale Both coastal and inland areas can be affected by high winds	Both coastal and inland areas can be affected by high winds	Poor driving conditions Loss of infrastructure Flooding Falling Trees
	Heavy Snow	Blizzards- Poor visibility	Poor Driving conditions Ice falling from turbine blades
	Severe Cold / Frost extremes of Temperature	Icy Roads /Impassable Roads Hypothermia Freezing of Supply Network	Poor Driving Conditions Public Health Risk Lack of Road Grit
	Thunder & Lightening Dense/ Persistent Fog Heat Wave /Drought	Road Traffic collisions	Loss of Infrastructure Poor driving conditions Public Health Risk Water Shortage
Hydrological	Flooding	Coastal / Inland	The risk of flooding at the Wind Farm Site is very low due to the elevated and sloping nature of the site and the high density of mountain streams which flow rapidly downslope. The Grid Connection is generally at low risk of flooding. Refer to Section 9.3.5 of this EIAR for a summary of the Flood Risk Assessment.
	Heavy Rain		The main risk of flooding within the Wind Farm Site is via pluvial flooding. This risk is limited to local flat areas due to the mountainous nature of the wider area. Surface water ponding/pluvial flooding may occur in some flat areas of the Wind Farm Site due to the presence of low permeability peat at the surface. Mostly, the risk of pluvial flooding is low, with the exception of local flat areas.

			The Grid Connection has a low risk of flooding. However, there are areas which may be prone to flooding, principally along the Blackwater River. Due to the depth of the underground cabling route, this will have no impact during the operational phase of the Proposed Development. During the construction phase, works along the underground electrical cabling route may have to be postponed following heavy rainfall events which could cause flooding in this area.
Geological	Landslide		Peat Instability
	Forest / Wilderness fire - Air Pollution		Majority of the Wind Farm Site and some of surrounding area is forested. Potential for mechanical fire within turbine.
Transportation Hazards			
Category	**Type**	**Subtype**	**Relevant Hazard to the Proposed Development**
Aviation	Aircraft Collision /Loss	Mid Air and Land	Shannon Airport
Rail	Mainline		Turbine Delivery will cross above the Limerick-Ennis line on the R463.
	Bridge		Not applicable
Road	Multiple Road Traffic Collision		Public Roads via which construction staff and materials access the site.
	Hazmat		Fuel Transport to/from site.
	Bridge		Approximately 3 no. bridge crossings on Grid Connection route.

Water	Inland Water ways	Pleasure Craft/Cruises Pollution from above	Not Applicable
	Coastal	Car Ferry/ passenger Ferries	Not Applicable
Technological Hazards			
Category	**Type**	**Subtype**	**Relevant Hazard to the Proposed Development**
Industrial Accidents	Explosions		Damage to Infrastructure Personal Injuries/ fatalities.
	Petrochemical Fires		Personal Injuries, severe burns/ fatalities Air Pollution
	Industrial Fires	LPG Tank Fire	Not Applicable
	Gas Emission		Not Applicable
	Fluid/ Fuel Emission		Refuelling on site
Explosions	Domestic	Natural Gas explosion	Not Applicable
	Bomb		Controlled blasting at Borrow Pit locations
	LPG		Not Applicable
	Pipeline		Not Applicable
Fires			Air Pollution
Building Collapse			Not Applicable
Hazardous substance		Accident at site	Not Applicable
		Transportation accident	Hazmat on roads
		Weapons	Not Applicable
	Biological	Leak/Weapons	Not Applicable
	Radiological	“Dirty Bomb”	Not Applicable

		Industrial Accident	Not Applicable
		Health facilities	Not Applicable
Pollution/Contamination	Air/Water Pollution		Fire Sediment-laden Water Run Off Fuel/hydrocarbon spill/leak.
	Extractive Mining Sites	Category A Extractive Sites	Not Applicable
Civil Hazards			
Category	**Type**	**Subtype**	**Relevant Hazard to the Proposed Development**
Civil Disorder / Disturbance	Protest Rioting		Not Applicable
Major Crowd Safety	(Movement, crushing etc.)	Pop Concerts Sports Events Fireworks displays Air shows	Not Applicable
Loss of Critical Infrastructure	Energy and Power Supply	Electricity	Connection to national grid.
		Natural Gas	Not Applicable
		Fuel Oil	Not Applicable
		Communications	Telecom operators, mobile phone networks.
Food Situation Crisis		Food Contamination Drought	Not Applicable
Water Supply		Shortage/ Contamination Freezing /Flooding	Not Applicable
Epidemics and pandemic		Communicable diseases	Not Applicable
Animal Disease		Foot & Mouth Avian Influenza	Not Applicable
Terrorism	Bombs	Car-bombs	Not Applicable

		Bombs in buildings	Not Applicable
		Fire-bombing	Not Applicable
	CBRNE		Not Applicable
	Disruption	Bomb scares	Not Applicable

The hazards which are most relevant to this assessment from Table 16-4 above are described in the sections that follow, under the following hazard categories:

- Meteorological
- Hydrological
- Peat Stability
- Aviation
- Traffic
- Industrial Accident
- Loss of Critical Infrastructure
- Contamination
- Health and Safety
- Turbine Safety
- Electromagnetic Interference

These hazards will be described in detail before mitigation measures to minimise the risk from relevant hazards are addressed in Section 16.4 below.

16.3.2 Meteorological

Ireland has a temperate, oceanic climate, resulting in mild winters and cool summers. The dominant influence on Ireland's climate is the Atlantic Ocean. As a consequence, Ireland does not suffer from the extremes of temperature experienced by many other countries at similar latitude. The hills and mountains, many of which are near the coasts, provide shelter from strong winds and from the direct oceanic influence.

The Met Éireann weather station at Shannon Airport which is located approximately 25.8 kilometres to the southwest of the Proposed Development, is the nearest weather and climate monitoring station to the Site that has meteorological data recorded for the 30-year period from 1991-2020. Meteorological data recorded at Shannon Airport over the 30-year period from 1991-2020 is shown in Table 11-4 of Chapter 11 Climate. The wettest months are October and January, and April is usually the driest. July is the warmest month with a mean daily temperature of 16° Celsius.

In terms of wind speeds, the average annual wind speed at Shannon Airport is 9.1 knots and there are, on average, 9.8 days per year where gale force winds are experienced. There are 5.9 days per year with snow or sleet.

The works programme for the construction stage of the development will take account of weather forecasts and work will be suspended by the Site Manager in the case of extreme weather events, as defined by Met Éireann.

The following forecasting and weather warning systems are available and will be used on a daily basis at the Site to direct proposed construction activities:

- General Forecasts: Available on a national, regional and county level from the Met Éireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- Weather Warning or Advisories: Met Éireann's main suite of warnings are issued by the duty forecaster between 10am and midday and are updated as necessary as new information becomes available. In general, warnings will not be issued more than 60-hours ahead of the expected adverse weather but advisories on potential hazards are issued up to a week in advance. The three warning categories are:
    - Yellow: Not unusual weather. Localised danger.
    - Orange: Infrequent. Dangerous/disruptive.
    - Red: Rare. Extremely dangerous/destructive.
- MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;
- 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Éireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and,
- Consultancy Service: Met Éireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest.

16.3.3 Hydrological

As detailed in Chapter 9 Hydrology and Hydrogeology, no recurring or historic flood incidents are recorded within the Wind Farm site or along the Grid Connection route.

The OPW Past Flood Events Maps have no records of recurring or historic flood instances within the Wind Farm Site. The closest mapped historic flood event is located ~1.5km to the southwest of the Wind Farm Site. The OPW Past Flood Events map does not record any historic or recurring flood events along the Grid Connection route. The closest mapped flood zones are located ~450m to the west of the Grid Connection route.

The main risk of flooding within the Wind Farm Site is via pluvial flooding. This risk is limited to local flat areas due to the mountainous nature of the wider area. Surface water ponding/pluvial flooding may occur in some flat areas of the Wind Farm Site due to the presence of low permeability peat at the surface. Mostly the risk of pluvial flooding is low, with the exception of local flat areas.

The proposed Grid Connection route is low risk of flooding. However, there are areas along the Grid Connection route which may be prone to flooding, principally along the Blackwater River. Due to the depth of the underground cabling route, this will have no impact during the operational phase of the Proposed Development. During the construction phase, works along the underground electrical cabling route may have to be postponed following heavy rainfall events which could cause flooding in this area.

The risk of the Wind Farm Site contributing to downstream flooding is also very low, as the long-term plan for the site is to retain and slow down drainage water prior to release, while there will be no direct discharge of runoff from the Wind Farm Site drainage into the existing site drainage network during the

short-term construction stage[3]. Robust drainage measures on the site will include swales, silt traps, check dams, settlement ponds and buffered outfalls. Please refer to the Chapter 9 Hydrology & Hydrogeology of this EIAR for further details.

16.3.4 Peat Stability

On the 12th of November 2020, a peat failure occurred on the site of the Meenbog Wind Farm as construction was being carried out on a floating road which was to provide access to a turbine hardstand and foundation. The failure occurred in an area comprising very weak peat upslope of the access road that was under construction.

Given the upland nature of the Proposed Development site and the presence of peat, geotechnical and peat stability considerations have been central to the design phase of the Proposed Development.

A comprehensive and robust Geotechnical & Peat Stability Assessment was undertaken for the Proposed Development and used to inform the design process including the siting of all proposed main infrastructure locations and drainage control measures. The Geotechnical & Peat Stability Assessment was informed by the Scottish Government's 2017 guidance document, *Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments.* Intrusive ground investigation works were carried out as part of the peat stability assessment included peat depth probing, shear strength testing, gauge coring, trial pitting and rotary boreholes. The extensive suite of ground investigations, the robust peat stability assessment and the lessons learned from the Meenbog Wind Farm peat slide will ensure that the risk of such an event, occurring during the construction, operation or decommissioning of the Proposed Development site is minimised. Please see Chapter 8 Land, Soils & Geology and Appendix 8-1 Geotechnical & Peat Stability Report for more details. In summary, the Wind Farm Site has an acceptable margin of safety and is considered to be at low risk of peat failure providing appropriate mitigation measures and construction controls are implemented and is suitable for wind farm development.

16.3.5 Aviation

An Aviation Impact Assessment (AIA) has been undertaken by Ai Bridges and Cyrrus Ltd Appendix 15-6). The AIA was informed by engagement and consultation with the Irish Aviation Authority (IAA). The AIA in Appendix 15-6 should be consulted for detailed information on the assessments, however a brief summary of the potential impacts and mitigation measures to minimise or eliminate the impacts are summarised below.

- Impact on Instrument Flight Procedures (IFPs) Shannon Airport
  - IFPs - The impacted IFP's will be withdrawn in line with the State Performance Based Navigation (PBN) Plan for Ireland on 06 June 2030 after which time there will no longer be an impact to the impacted IFP's.
  - The IAA agreed in principle that increasing the Procedure Design Gradient for the Standard Instrument Departure (SID) departure would be incorporated in updated IFP designs by late 2022.
  - The IAA recommends withdrawal of the VOR IAP on the basis that this would be in line with the State PBN plan and that RNP IAPs are planned for Shannon during 2022. Also as referenced in the State PBN Plan (section 11 in Appendix 14) the Shannon Airport currently has approach runways are in line for Required Navigation Performance (RNP) approaches by 25 January 2024:.

[3] *The potential effects associated with decommissioning of the Wind Farm Site will be similar to those associated with construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works in comparison to construction phase works.*

- ATCSMAC Chart - The IFP Assessment shows that there are four mitigation options that allows for safe vectoring onto the Instrument Approach Procedures (IAP), which includes an option for a shortened Instrument Landing System (ILS) on an RNP approach. The ATCSMAC can be re-designed on the basis of an Airspace Redesign Concept i.e. a RNP Instrument Approach Procedure (IAP) on a shortened ILS as a possible mitigation, and which would be operationally feasible for Shannon Air Traffic Control (ATC).

- Impact on Woodcock Hill Radar
  - Reflections - The Thales RSM970 MSSR Sited at Woodcock Hill is 5.6 km from the nearest wind turbine. The Thales radar utilizes a two-stage system to prevent both temporary (Dynamic) and permanent (Static) reflections being displayed. It also has inbuilt adaptive reflection processing. This is referenced in The Thales RSM970 MSSR Technical Description Document (Appendix 11.2).To prevent possible reflection issues, some minor optimisations may be required. This is usually carried out as part of the scheduled maintenance of the equipment.
  - The IAA\AirNav have scheduled an upgrade in the next two to five years of all the radar surveillance equipment in the state and these upgrades will likely include updates to the two-stage system within MSSR to prevent reflections being displayed. This would be conformed as part of an asset conductions survey by the Radar Manufacturer (Thales) .
  - Deflections - The Thales RSM970 MSSR uses a well-established processing system to remove any False Replies Unsynchronised In Time (FRUIT). This process removes the issue of deflections from the system. No additional optimisation is required as a DEFRUITER is part of the standard MSSR processing on the Thales system.
  - Shadowing - Due to the close proximity of the Turbines to the Woodcock Hill radar, some shadowing will occur. A detailed previous assessment was completed by Cyrrus on the previous 18-turbine design. It was considered any shadowing would be minimal and be operationally tolerable. With the reduction in turbines to 9, it is assumed the shadowing would be no worse than the previous assessment and so remain operationally tolerable.
- Impact on Navigation Aids (NAVAIDS)
  - The Proposed Development will have no adverse effect on the Flight Inspection Procedures and procedures associated with the Runway 24 Instrument Landing Systems at Shannon Airport.

In summary, the findings of the AIA concludes that with the assessment outcomes and mitigation measures, the residual effects are not significant.

16.3.6 Traffic

The Proposed Development (Wind Farm Site and Grid Connection) will utilise the surrounding road network during the construction, operational and decommissioning phases of the development. Construction related traffic will originate from the delivery of materials to site, removal of surplus excavated material from site and transport of employees to, from and throughout the Site. The localised traffic disruptions will be mitigated through the use of industry standard traffic management measures. Please see Chapter 15 Material Assets and Appendix 15-2: Traffic Management Plan for details.

Prior to the commencement of the construction phase of the Proposed Development a detailed Traffic Management Plan will be prepared by the Contractor for agreement with the relevant local authorities and An Garda Síochána. The TMP submitted with this application includes recommendations for the following:

- Traffic Management Coordinator.
- Delivery Programme
- Information to locals
- A Pre and Post Construction Condition Survey
- Liaison with the relevant local authority
- Implementation of temporary alterations to road network at critical locations
- Identification of delivery routes
- Delivery times of large turbine components
- Travel plan for construction workers
- Additional measures
- Re-instatement works

Please see Chapter 15 Material Assets and Appendix 15-2 Traffic Management Plan for details.

16.3.7 Industrial Accident

The Proposed Development is not connected to or in the vicinity of any site regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations (SEVESO sites), therefore no significant effects associated with major industrial accidents involving dangerous substances are anticipated. Petrochemical fires and fires from fuel emissions, leakages and spillages could occur causing personal injury, structural damage and forest fires.

16.3.8 Loss of Critical Infrastructure

EirGrid operates and develops Ireland's electricity grid. This includes interconnecting to neighbouring grids and running the wholesale electricity market. The grid safely brings power from generators such as wind farms to the ESB network that supplies homes and business in Ireland. It also brings power directly to large energy users. There are two types of electricity generation: synchronous generation and non-synchronous generation. Synchronous generation produces the same amount of electricity all the time e.g., fossil fuels. Non-synchronous generation produces varying amounts of electricity depending on the energy available. EirGrid operate the grid from National Control Centres (NCCs) in Dublin and Belfast, matching electricity production to customer demand, switching from synchronous to non-synchronous where required to ensure no power outages. Therefore, any technical fault during the operational phase at the Proposed Development would not impact the local or national energy supply.

16.3.9 Contamination

The Proposed Development has the potential to cause contamination and pollution of groundwater and surface water from potential release of hydrocarbons, earthworks and excavations on site. A Construction Environment Management Plan (CEMP) has been prepared in conjunction with the Environmental Impact Assessment Report (EIAR) and the Natura Impact Statement (NIS) which accompanies the planning application for the Proposed Development.

Section 3 of the CEMP sets out details of the environmental controls to be implemented on site. The CEMP provides details of site drainage measures, peat stability monitoring measures, waste management and pollution prevention measures for refuelling and managing hazardous materials and cement-based products. The CEMP also sets out the Emergency Response Procedure to be adopted in the event of an emergency including contamination, health and safety and environmental protection. The CEMP provides details on all mitigation and monitoring measures to be actioned prior to construction, during the construction, operation and decommissioning phase. The CEMP will be subject to ongoing review through regular environmental auditing and site inspections during the construction phase. This will confirm the efficacy and implementation of all mitigation measures and commitments identified in the application documentation. Please see Chapter 4 Description and Appendix 4-3 CEMP for details.

16.3.10 Health and Safety

During construction of the Proposed Development, all staff will be made aware of and adhere to the Health & Safety Authority's *'Safety, Health and Welfare at Work (Construction)' Regulations 2013 (S.I. 291 of 2013*). This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan. An Emergency Response Plan (ERP) will be implemented and adhered to on site. The ERP provides details of procedures to be adopted in the event of an emergency in terms of site health and safety and environmental protection. Please see Chapter 4 Description and Appendix 4-3 CEMP for details.

16.3.11 Turbine Safety

Turbines pose no threat to the health and safety of the general public. The Department of the Environment, Heritage and Local Government (DoEHLG)'s *'Wind Energy Development Guidelines for Planning Authorities 2006'* state that there are no specific safety considerations in relation to the operation of wind turbines. Fencing or other restrictions are not necessary for safety considerations. People or animals can safely walk up to the base of the turbines.

The DoEHLG Guidelines state that there is a very remote possibility of injury to people from flying fragments of ice or from a damaged blade. However, the blades are composite structures with no bolts or separate components and the danger is therefore minimised. The build-up of ice on turbines is unlikely to present problems. The wind turbines will be fitted with anti-vibration sensors, which will detect any imbalance caused by icing of the blades. The sensors will cause the turbine to wait until the blades have been de-iced prior to beginning operation.

Turbine blades are manufactured of glass reinforced plastic which will prevent any likelihood of an increase in lightning strikes within the Wind Farm Site or the local area. Lightning protection conduits will be integral to the construction of the turbines. Lightning conduction cables, encased in protection conduits, will follow the electrical cable run, from the nacelle to the base of the turbine. The conduction cables will be earthed adjacent to the turbine base. The earthing system will be installed during the construction of the turbine foundations.

Estimations on the likelihood of turbines catching fire range between 1 in 2,000 and 1 in 7,000, which in the absence of lightening, are speculated to generally be caused by the braking system. The risk of turbine fires will be reduced through proper turbine maintenance, while the proactive installation of fire-suppression technology will also reduce this risk.

16.3.12 Electromagnetic Interference

The provision of underground electric cables of the capacity proposed is common practice throughout the country and installation to the required specification does not give rise to any specific health concerns.

The extremely low frequency (ELF) electric and magnetic fields (EMF) associated with the operation of the proposed cables fully comply with the international guidelines for ELF-EMF set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), a formal advisory agency to the World Health Organisation, as well as the EU guidelines for human exposure to EMF. Accordingly, there will be no operational impact on properties (residential or other uses), construction staff, operational & maintenance staff or recreational users of the site as the ICNIRP guidelines will not be exceeded at any distances even directly above the cables.

The ESB document 'EMF & You' (ESB, 2017)[4] provides further practical information on EMF. Further details on the potential impacts of electromagnetic interference to telecommunications and aviation are presented in Chapter 15 Material Assets of this EIAR.

16.4 Risk Assessment

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

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

As outlined in Section 16.2.3.2.2, the consequence rating assigned to each potential risk assumes that all proposed pre-mitigation measures and safety procedures have failed to prevent the major accident and/or disaster.

16.4.1 Likely Significant Effects

16.4.1.1 Do-Nothing Scenario

If the Proposed Development was not developed, the Site will continue to function as it does at present, with no changes made to the current land-use. The impact of this is considered neutral in the context of the EIAR. While the potential for the disasters listed in this chapter would not arise, if the Proposed Development were not to proceed, the opportunity to capture an even greater part of County Clare's valuable renewable energy resource would be lost, as would the opportunity to further 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 Assessment of Effects During Construction

A risk register has been developed which contains all potentially relevant risks identified during the construction phase of the Proposed Development, as guided by Table 16-4 above. Seven risks specific to the construction of the Proposed Development have been identified and are presented in Table 16-5.

Table 16-5 Risk Register - Construction Phase

Risk ID	Potential Risk	Possible Cause
Potential vulnerability to disaster risks		
A	**Severe Weather** Risk to construction activity on site	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds.

[4] *EMF & You: Information about Electric & Magnetic Fields and the electricity network in Ireland Available at: https://esb.ie/docs/default-source/default-document-library/emf-public-information_booklet_v9.pdf?sfvrsn=0.*

B	**Flooding** High levels of surface water on site	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds.
C	**Peat Stability** Movement of peat within the site during construction	Mismanagement of excavated material on site. Severe weather conditions- storm, flooding.
Potential to cause accidents and / or disasters.		
D	**Utility emergencies** Risk of construction activity along the Grid Connection underground electrical cabling route	Construction activity along the grid and road network impacting on local services and utilities.
E	**Traffic Incident** Collisions onsite and offsite with vehicles involved in construction of Proposed Development	Driver negligence or failure of vehicular operations on site roads. Traffic Management Plan 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 Grid Connection works area.	Fuel spillage during delivery to site. Failure of fuel storage tank or tanks in plant and machinery and vehicles. Drainage and seepage water resulting from infrastructure excavation; Stockpiled excavated material providing a point source of exposed sediment; Construction of the Proposed Development cable trench resulting in entrainment of sediment from the excavations during construction; Erosion of sediment from emplaced site drainage channels; and Frack Out associated with horizontal directional drilling (HDD) along Grid Connection underground electrical cabling route which may result in sediment release to surface water.

G	**Fire / Explosion**	Controlled blasting at Borrow Pits; Equipment or infrastructure failure; Electrical problems; and Employee negligence.

16.4.1.3 Assessment of Effect During Operation

Six risks specific to the operation of the Proposed Development have been identified and are presented in Table 16-6.

Table 16-6 Risk Register – Operational Phase

Risk ID	Potential Risk	Possible Cause
Potential vulnerability to disaster risks		
H	**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.
I	**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.
Potential to cause accidents and / or disasters.		
J	**Fire / Explosion**	Equipment or infrastructure failure; Electrical problems; and Employee negligence.
K	**Collapse/ damage to structures**	Earthquakes; and Vehicular collisions due to driver negligence on public roads.

L	**Traffic Incident** Collisions onsite and offsite with vehicles involved in operation of Proposed Development	Driver negligence or failure of vehicular operations on site roads. Traffic Management not implemented
M	**Loss of Critical Infrastructure**	Electrical fault at substation bay

16.4.1.4 Assessment of Effect During Decommissioning

Six risks specific to the decommissioning of the Proposed Development have been identified and are presented in Table 16-7.

Table 16-7 Risk Register – Decommissioning Phase

Risk ID	Potential Risk	Possible Cause
Potential vulnerability to disaster risks		
N	**Severe Weather** Risk to decommissioning activity on site	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds
O	**Flooding of site** Risk of flooding in areas surrounding the Site impacting the decommissioning.	Extreme weather- periods of heavy rainfall, taking into account climate change and strong winds
Potential to cause accidents and / or disasters.		
P	**Traffic Incident** Collisions onsite and offsite with vehicles involved in construction of Proposed Development	Driver negligence or failure of vehicular operations on site roads. Traffic Management not implemented
Q	**Contamination** Discharge or spillage of fuel, chemical solvents into watercourse or percolated to groundwater	Fuel spillage during delivery to site. Failure of fuel storage tank or tanks in plant and machinery and vehicles. Drainage and seepage water resulting from infrastructure excavation. Erosion of sediment from emplaced site drainage channels.
R	**Fire/Gas explosion**	Petrochemical Fires causing personal injury, structural damage and forest fires.

S	**Loss of Critical Infrastructure**	Electrical fault at substation bay.

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 16-8.

The risk register is based upon possible risks associated with the Proposed Development. As outlined in Section 16.2.3.2.2, 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 16-8 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	Severe Weather	Extreme weather-periods of heavy rainfall, taking into account climate change and strong winds	Illness or loss of life; Sedimentation of nearby watercourse Damage to, or depletion of aquatic habitats and species;	3	The risk of severe weather is unlikely when considering the assessment in Chapter 11 and weather conditions recorded over the last 30 years within the area. The construction period will be scheduled in the near-term, in a climate similar to the present-day.	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, with 'no fatalities and a small number of minor injuries with first aid treatment'. No contamination, localised effects.	3
B	Flooding	Extreme weather-periods of heavy rainfall, taking into account	Illness or loss of life; Sedimentation of nearby watercourse	2	The risk of flooding is considered very unlikely when taking into account the baseline	1	The risk of flooding during the construction phase will result in a minor consequence in	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		climate change and strong winds	Damage to, or depletion of aquatic habitats and species;		assessment in Chapter 9 Hydrology & Hydrogeology of the EIAR and due to no recurring or historic flood incidents being recorded within the Wind Farm site or along the Grid Connection route.		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' No contamination of environment (e.g. watercourses), localised effects.	
C	Peat Stability	Mismanagement of excavated material on site Extreme weather conditions	Movement of peat within the site; Sedimentation of nearby watercourse; Damage to, or depletion of aquatic habitats and species;	1	The Proposed Development has been designed to minimise the potential for peat instability and failure. Refer to Appendix 8-1: Geotechnical and Peat Stability Assessment Report	2	The risk of peat instability during the construction phase will result in a limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration'. Simple contamination of environment (e.g. watercourses), localised effects of short duration.	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
D	Utility emergencies	Construction activity along road network during grid connection installation impacting on local services and utilities	Illness or loss of life; Disruption to services	3	Confirmatory surveys will be carried out by the Contractor to ensure that the Grid Connection is designed to take into consideration any services and utilities with the road network.	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'.	3
E	Traffic Incident	Driver negligence or failure of vehicular operations on site roads. Traffic Management not implemented or not adhered	Injury or loss of life.	3	A limited number of vehicles will be permitted on the site as part of the construction phase. As such, it can be determined that there is some 'opportunity, reason or means' for a vehicle collision to occur on site or off site, 'at some time.' An unlikely	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)
					risk is therefore predicted.			
F	Contamination	Fuel spillage during delivery to site. Failure of fuel storage tank or tanks in plant and machinery and vehicles. Drainage and seepage water resulting from infrastructure excavation; Stockpiled excavated material providing a point source of exposed sediment; Construction of the Proposed Development	Release of suspended solids to groundwater. Contamination of local drinking water supplies and groundwater aquifers. Groundwater and surface water emissions from construction activities including trench excavations and HDD (frack out).	2	As outlined in Chapter 4 Description of the Proposed Development and the CEMP Appendix 4-3, fuel will be stored on-site 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 mitigation measures as detailed in Chapter 9 Hydrology & Hydrogeology.	2	The risk of a fuel spillage or impact on surrounding 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' through the use of bunded containment areas and proposed drainage mitigation measures during construction. The Grid Connection route is located in the existing road network which is of low value environmental receptor. HDD is planned for a limited number of locations and will be	4

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		resulting in entrainment of sediment from the excavations during construction; and, Erosion of sediment from emplaced site drainage channels.					controlled to prevent significant environmental effects should frack out occur.	
G	Fire/explosion	Equipment or infrastructure failure; Fuel spillage/storage Electrical problems; and Employee negligence	Illness or loss of life; Damage to, or depletion of habitats and species; and Impacts on ambient air quality.	2	As outlined in Chapter 4 Description of the Proposed Development and Appendix 4-3 CEMP, fuel will not be stored on-site post construction therefore fuel is not considered to be a significant fire risk. In accordance with Chapter 19 of the Safety, Health and Welfare at Work Act 2005 (the 2005 Act), the development shall be	2	Should a fire/explosion occur at the site, a limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration' due to the nature of the 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	4

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
					subject to a fire safety risk assessment which will assist in the identification of any major risks of fire on site.		with 'some inconvenience'. Simple contamination of environment (e.g. watercourses), localised effects of short duration.	
Operational Phase								
H	Severe Weather	Extreme weather-periods of heavy rainfall, taking into account climate change and strong winds	Illness or loss of life;	2	The risk of severe weather is unlikely when considering the assessment in Chapter 11 Climate and weather conditions recorded over the last 30 years within the area.	1	The risk of severe weather conditions during the operational 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
I	Contamination	A vehicular incident, refuelling incident, wastewater or	Damage to, or depletion of aquatic habitats and species	2	As outlined in Chapter 4 Description of the Proposed Development and Appendix 4-3 CEMP, fuel will be	2	The risk of a fuel spillage or impact on surrounding drainage during the operational stage will result in a	4

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		sewage transportation in the operational phase.	Release of suspended solids to surface watercourses and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality and fish stocks of downstream water bodies		stored on-site 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 Hydrology & Hydrogeology.		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. Simple contamination of environment (e.g. watercourses), localised effects of short duration.	
J	Fire/explosion	Equipment or infrastructure failure; Fuel spillage/storage Electrical problems; and	Illness or loss of life; Damage to, or depletion of habitats and species; and Impacts on ambient air quality.	2	As outlined in Chapter 4 Description of the Proposed Development, 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 site, a limited consequence is that there would be 'a limited number of people affected' with 'localised effects of short duration' due to the nature of the project and the lack of infrastructure	4

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		Employee negligence			In accordance with Chapter 19 of the Safety, Health and Welfare at Work Act 2005 (the 2005 Act), the development shall be subject to a fire safety risk assessment which will assist in the identification of any major risks of fire on site.		or fuel storage during operation that would result in any such incident. There will be 'normal community functioning' in the area with 'some inconvenience'. Simple contamination of environment (e.g. watercourses), localised effects of short duration.	
K	Collapse/ damage to structures	Landslide/ Earthquake; and Extreme weather conditions such as flooding and storms. Vehicular collisions due to driver negligence Mismanagement of excavated material on site	Injury or loss of life. Movement of peat within the Wind Farm Site; Sedimentation of nearby watercourse; Damage to, or depletion of aquatic habitats and species;	2	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	1	The risk of infrastructure collapse during the operational phase will result in a minor consequence in that 'small number of people would be affected' and no real likelihood of any impact on any environmental receptors.	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
					unlikely to be damaged or collapse due to seismic activity. Having regard to public speed limits within the site, it is not predicted that any collision of vehicles and any infrastructure would result in significant damage/collapse.			
L	Traffic Incident	Driver negligence or failure of vehicular operations on site roads. Traffic Management not implemented	Injury or loss of life.	3	A limited number of vehicles will be permitted on the Wind Farm Site as part of the operation phase. As such, it can be determined that there is some 'opportunity, reason or means' for a vehicle collision to occur on site, 'at some time.' An unlikely risk is therefore predicted.	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)
M	Loss of Critical Infrastructure	Equipment or infrastructure failure; Electrical problems; and Employee negligence Landslide/ Earthquake; and Extreme weather conditions such as flooding and storms.	Injury or loss of life	1	EirGrid operate the grid from National Control Centres matching electricity production to customer demand, switching from synchronous to non-synchronous where required to ensure no power outages. The Grid Connection will originate from the proposed onsite 110kV electrical substation via an underground cable to Ardnacrusha 110kV Electrical Substation.	2	Should a power failure occur at the Ardnacrusha 110kV Electrical Substation, it will result in a limited number of people affected- localised effects of short duration.	2
Decommissioning Phase								
N	Severe Weather	Extreme weather- periods of heavy rainfall, taking into account	Illness or loss of life; Sedimentation of nearby watercourse	2	The risk of severe weather is unlikely when considering the assessment in Chapter 11 Climate and weather	1	The risk of severe weather conditions during the decommissioning phase will result in a minor	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		climate change and strong winds	Damage to, or depletion of aquatic habitats and species;		conditions recorded over the last 30 years within the area.		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'. No contamination of environment (e.g. watercourses), localised effects.	
O	Flooding	Extreme weather-periods of heavy rainfall, taking into account climate change and strong winds	Illness or loss of life; Sedimentation of nearby watercourse Damage to, or depletion of aquatic habitats and species;	2	The risk of flooding is considered very unlikely when taking into account the baseline assessment in Chapter 9 Hydrology & Hydrogeology of the EIAR and due to no recurring or historic flood incidents are recorded within the Wind Farm Site or along the Grid Connection route.	1	The risk of flooding 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'. No contamination of environment (e.g.	2

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
							watercourses), localised effects.	
P	Traffic Incident	Driver negligence or failure of vehicular operations on site roads. Traffic Management not implemented	Injury or loss of life.	3	A limited number of vehicles will be permitted on the Wind Farm Site as part of the decommissioning phase. As such, it can be determined that there is some 'opportunity, reason or means' for a vehicle collision to occur on site or off site, 'at some time.' An unlikely risk is therefore predicted.	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
Q	Contamination	Fuel spillage during delivery to site. Failure of fuel storage tank or tanks in plant and machinery and vehicles.	Damage to, or depletion of aquatic habitats and species. Release of suspended solids to surface watercourses and could result in an increase in the suspended sediment load, resulting	2	As outlined in Chapter 4 Description of the Proposed Development, fuel will be stored on-site but in a bunded area to ensure containment and prevent spillages of fuel. No fuels, chemicals or solvents will be stored	2	The risk of a fuel spillage or impact on surrounding 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	4

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
		Drainage and seepage water resulting from infrastructure removal; Erosion of sediment from site drainage channels.	in increased turbidity which in turn could affect the water quality and fish stocks of downstream water bodies.		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 Hydrology & Hydrogeology.		duration' through the use of bunded containment areas during operation. Simple contamination of environment (e.g. watercourses), localised effects of short duration.	
R	Fire/explosion	Equipment or infrastructure failure; Fuel spillage/storage Electrical problems; and Employee negligence	Injury or loss of life Structural damage Forest fires Air Pollution Damage to, or depletion of habitats and species Contamination	2	As outlined in Chapter 4 Description of the Proposed Development, fuel will not be stored on-site post construction therefore fuel is not considered to be a significant fire risk. In accordance with Chapter 19 of the Safety, Health and Welfare at Work Act 2005 (the 2005 Act), the development shall be subject to a fire safety	2	Should a fire/explosion occur at the Site, a limited consequence in that there would be 'a limited number of people affected' with 'localised effects of short duration' due to the nature of the 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	4

Risk ID	Potential Risk	Possible Cause	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Consequence x Likelihood)
					risk assessment which will assist in the identification of any major risks of fire on Site.		with 'some inconvenience'. Simple contamination of environment (e.g. watercourses), localised effects of short duration.	
S	Loss of Critical Infrastructure	Equipment or infrastructure failure; Electrical problems; and Employee negligence Landslide/ Earthquake; and Extreme weather conditions such as flooding and storms.	Injury or loss of life	1	EirGrid operate the grid from National Control Centres matching electricity production to customer demand, switching from synchronous to non-synchronous where required to ensure no power outages. The Grid Connection will originate from the proposed onsite 110kV electrical substation via an underground cable to Ardnacrusha 110kV Electrical Substation.	2	Should a power failure occur at the Ardnacrusha 110kV Electrical Substation, it will result in a limited number of people affected- localised effects of short duration.	2

The risk assessment for each of the potential risks identified are consolidated in Table 16-9 which provides their 'risk score.' A corresponding risk matrix is provided in Table 16-10, which is colour coded in order to provide an indication of the critical nature of each risk. As outlined in Section 16.2.3.2.2, the red zone represents 'high risk' scenarios', the amber zone represents 'medium risk scenarios and the green zone represents 'low risk scenarios.

Table 16-9 Risk Scores

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

Table 16-10 Risk Matrix

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

Table 16-10, presents the potential risks identified during the construction, operation and decommissioning of the Proposed Development, all or which can be classified as 'low risk scenarios.'

The scenarios 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 Development (i.e., F, G, I, J, Q, P in Table 16-10) are identified below:

16.4.1.5.1 *Contamination During Construction, Operation and Decommissioning (F, I, Q)*

There is a potential risk of contamination from site activities during the construction, operation and decommissioning phases from potential release of hydrocarbons. The risk of contamination was given a risk score of 4. However, as outlined in Chapter 4 Section 4.4.2.2, measures are proposed and 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, operation and decommissioning phases.

16.4.1.5.2 *Fire/ Explosion During Construction, Operation and Decommissioning (G, J, P)*

There is a potential risk of fire/explosion at the Proposed Development site. However, as outlined in Section 16.2.1, the scope of this assessment has been based on the understanding that the Proposed Development 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 Development shall be subject to a fire safety risk assessment which will assist in the identification of any major risks of fire on Site.

Therefore, the risk of fire/explosion occurring at the Proposed Development resulting in a major accident and/or disaster was given a risk score of 4. This indicates a scenario that is 'very unlikely' to occur and having 'limited' consequences should it do so, representing a 'low-risk scenario' during the construction, operational and decommissioning phases.

16.4.2 Mitigation Measures

As outlined in Section 16.4.1.5, the scenario with the highest risk score in terms of the occurrence of major accident and/or disaster was identified as, 'Contamination' during the construction, operation and decommissioning phases and risk of 'Fire/ Explosion' during the construction, operation and decommissioning phases.

The Proposed Development has been designed and built in accordance with the best practice measures set out in this EIAR and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design.

As discussed, the application for the Proposed Development is accompanied by a CEMP which sets out details of the environmental controls to be implemented on site. The CEMP sets out the Emergency Response Procedure to be adopted in the event of an emergency including contamination, health and safety and environmental protection. The CEMP provides details on all mitigation and monitoring measures to be actioned prior to construction, during the construction, operation and decommissioning phase. The CEMP will be subject to ongoing review through regular environmental auditing and site inspections. This will confirm the efficacy and implementation of all mitigation measures and commitments identified in the application documentation.

The CEMP includes an Emergency Response Plan (ERP). It provides details of procedures to be adopted in the event of an emergency relating to health & safety or environmental protection. The site ERP includes details on the response required and the responsibilities of all personnel in the event of an emergency. Please see Chapter 4 and Appendix 4-3 of the EIAR for details.

16.4.3 Residual Effects

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

It is considered that when the mitigation and monitoring measures outlined in the CEMP are implemented and adhered to there will not be significant residual effect(s) associated with the construction, operation and decommissioning of the Proposed Development.

16.4.4 Assessment of Cumulative Effects

16.4.4.1 Cumulative Impact Assessment

A search in relation to all existing, permitted and proposed projects within the zone of influence of the project was carried out as part of the EIAR. The Proposed Development has been considered, cumulatively with the projects set out in Chapter 2, Section 2.7 of the EIAR.

Therefore, with the implementation of the proposed mitigation, there will be no cumulative effects associated with the construction, operational or decommissioning phases of the Proposed Development and other wind farms within the cumulative study area.