

18 Major Accidents and Disasters

18.1 Introduction

This chapter describes likely significant effects on the environment arising from the vulnerability of the proposed scheme to risks of major accidents and/or natural disasters.

The assessment of the vulnerability of the proposed scheme to major accidents and natural disasters is carried out in compliance with the EIA Directive which states the need to provide:

“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 concerned¹”

The underlying objective of this assessment is to ensure that appropriate precautionary actions are taken for those projects which *“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 disasters, if any, that the proposed scheme could be vulnerable to;
- The potential for these major accidents and/or 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.

18.2 Assessment Methodology

18.2.1 General

The scope and methodology of this assessment is centred on the understanding that the proposed scheme will be designed, built and operated in line with best international current practice. As such, major accidents resulting from the proposed scheme will be very unlikely.

The scope and methodology presented in the following sections is based on the provisions of the EIA Directive, the draft EPA Guidelines², EU Commission guidance³ and other published risk assessment methodologies as described in

¹ Directive 2014/52/EU - Section 8, Annex IV (Information required for the EIAR)

² EPA (2017) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports: Draft, August 2017.

³ European Commission (2017) Environmental Impact Assessment of Projects- Guidance on the preparation of the Environmental Impact Assessment Report

Section 18.2.4.2 and professional judgement.

A risk analysis-based methodology that covers the identification, likelihood and consequence of major accidents and/or disasters has been used for this assessment (Refer to **Section 18.2.4** for further detail on this approach).

The assessment of the risk of major accidents and/or disaster considers all factors defined in the EIA Directive that have been considered in this EIAR, i.e. population and human health, biodiversity, land, soil, water, air and climate and material assets, cultural heritage and the landscape.

18.2.2 Key Definitions

Key terms used in this chapter are set out below and are based on IEMA (2020) *Major Accidents and Disasters in EIA – A Primer*.

A major accident is an event that threatens immediate or delayed serious environmental effects to human health, welfare and/or the environment and require the use of resources beyond those of the client or its appointed representatives to manage. Whilst malicious intent is not accidental, the outcome (e.g. train derailment) may be the same and therefore many mitigation measures will apply to both deliberate and accidental events.

A disaster is a man-made/external hazard (such as an act of terrorism) or a natural hazard (such as an earthquake) with the potential to cause an event or situation that meets the definition of a major accident.

Vulnerability - describes the potential for harm as a result of an event, for example due to sensitivity or value of receptors. In the context of the EIA Directive, the term refers to the ‘exposure and resilience’ of the development to the risk of a major accident and/or disaster. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact.

18.2.3 Guidance and Legislation

18.2.3.1 Legislative Requirements

The following paragraphs set out the requirements of the EIA Directive in relation to major accidents and/or natural disasters.

Recital 15 of the EIA Directive states that:

“In order to ensure a high level of protection of the environment, precautionary actions need to be taken for certain projects which, because of their vulnerability to major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes) are likely to have significant adverse effects on the environment. For such projects, it is important to consider their vulnerability (exposure and resilience) to major accidents and/or disasters, the risk of those accidents and/or disasters occurring and the implications for the likelihood of significant adverse effects on the environment. In order to avoid duplications, it should be possible to use any relevant information available and obtained through risk assessments

carried out pursuant to Union legislation, such as Directive 2012/18/EU of the European Parliament and the Council⁴ and Council Directive 2009/71/Euratom⁵, or through relevant assessments carried out pursuant to national legislation provided that the requirements of this Directive are met.”

Article 3 of the EIA Directive requires that the EIAR shall identify, describe and assess in the appropriate manner, the direct and indirect significant effects on population and human health, biodiversity, land, soil, water, air and climate, material assets, cultural heritage and landscape deriving from (amongst other things) the “*vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned*”.

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”.

18.2.3.2 Guidance Documents

A number of guidance documents and published plans have been reviewed and considered in order to inform this assessment, as described in the following sections.

European Commission (2017) Environmental Impact Assessment of Projects- Guidance on the preparation of the Environmental Impact Assessment Report

The European Commission Guidance³ outlines the legislative requirements and key considerations which should be taken into account in the preparation of EIARs with respect to accident and disaster risks.

The Guidance lists the following issues which EIARs should address:

- What can go wrong with a Project?
- What adverse consequences might occur to human health and to the environment?

⁴Directive 2012/18/EU of the European Parliament and the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC (OJ L 187, 24.7.2012, p. 1).

⁵ Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations (OJ L 172, 2.7.2009, p. 18).

- How likely are these consequences?
- What is the Project's state of preparedness in case of an accident/disaster?
- Is there a plan for an emergency situation?

EPA (2017) Draft EPA Guidelines on information to be contained in EIAR

The draft EPA guidelines² refer to major accidents and/or disasters in a number of sections including:

- **Characteristics of the Project** – The draft EPA guidelines² state under **Section 3.5.2** that the project characteristics should include “*a description of the Risk of Accidents – having regard to substances or technologies used.*”
- **Impact assessment** - The draft EPA guidelines² state under **Section 3.7.1** that the impact assessment should, in accordance with Annex IV(5) of the EIA Directive, include “*the risks to human health, cultural heritage or the environment (for example due to accidents or disasters).*”
- **Likelihood of Impacts** - The draft EPA guidelines² state the following under **Section 3.7.3**:

“To address unforeseen or unplanned effects the Directive further requires that the EIAR takes account of the vulnerability of the project to risk of major accidents and /or disasters relevant to the project concerned and that the EIAR therefore explicitly addresses this issue. The extent to which the effects of major accidents and / or disasters are examined in the EIAR should be guided by an assessment of the likelihood of their occurrence (risk). This may be supported by general risk assessment methods or by systematic risk assessments required under other regulations e.g. a COMAH (Control of Major Accident Hazards involving Dangerous Substances) assessment.”

EPA (2014) Guidance on Assessing and Costing Environmental Liabilities

The EPA guidance document⁶ above presents a systematic approach for assessing and costing environmental liabilities associated with closure, restoration/aftercare and incidents. This guidance is targeted at activities falling under the various EPA authorisation regimes including the Industrial Emissions Directive (IED), Integrated Pollution Prevention and Control (IPPC), wastewater discharge authorisations (WWDA) and dumping at sea (DaS).

This document⁶ provides guidance on the identification and quantification of risks, focusing on unplanned, but possible and plausible events that may occur during the construction and operational phases of licensed facilities and/or activities. Specifically, guidance is also provided on a range of risk assessment and evaluation techniques in **Section 3.3** of the draft EPA guidance⁶.

⁶ EPA (2014) Guidance on Assessing and Costing Environmental Liabilities

DoEHLG (2010) A Framework for Major Emergency Management Guidance Document 1-A Guide to Risk Assessment in Major Emergency Management

The Department of the Environment, Heritage and Local Government, as it then was, published a guidance note⁷ in January 2010 on best practice in the area of risk assessment for major emergency management.

The document⁷ provides guidance on the various stages of the risk assessment process and how it should be employed to inform mitigation and detailed planning during major emergency situations. Part 1 of the guidance⁷ defines criteria for classifying impact and likelihood scenarios in order to support the risk assessment process, as well as a process for recording the risk assessment.

Department of Defence (2017) National Risk Assessment 2019: Overview of Strategic Risks

The National Risk Assessment (NRA)⁸ provides an opportunity for the identification, discussion and consideration of risks facing Ireland over the short, medium and long term. Since the NRA was first published in 2014, the annual Report has served as an important indicator of national level risks and has called attention to various risks that Ireland might face.

IEMA (2020)⁹ Major Accidents and Disasters in EIA – A Primer

The Major Accidents and Disasters in EIA - A Primer, produced by the Institute for Environmental Management and Assessment (IEMA) and Arup, provides an assessment methodology for major accidents and disasters based on known current practise in the UK to date and provides definitions of key terminology. It offers a proportionate method for a typical assessment approach to determine a project's vulnerability.

In the absence of a stand-alone guidance document for the assessment of Major Accidents and Disasters, including risk assessment methodology, a combination of the above guidance has been used to inform this assessment as deemed appropriate. **Table 18.1** includes a summary of the application of the guidance.

Table 18.1 Guidance Application

Guidance	Application of Guidance
DoD (2017)	References purposes - in formation on national level risks
DoEHLG (2010)	Criteria for categorising impact; risk classification – likelihood, consequence; risk evaluation and assessment methodology
EC (2017)	General guidance; aspects of project for which risks are identified.

⁷ DoEHLG (2010) A Guide to Risk Assessment in Major Emergency Management

⁸ Department of Defence (2017) A National Risk Assessment for Ireland 2017

⁹ IEMA (September 2020) Major Accidents and Disasters in EIA – A Primer

Guidance	Application of Guidance
EPA (2017)	General guidance
EPA (2014)	Guidance on the identification and quantification of risks of unplanned, but plausible events that may occur during the construction and operational phases; risk assessment methodology
IEMA (2020)	General guidance; definitions of “major accident”, “disaster” and “vulnerability”. (Note EC (2017) and EPA (2017) do not provide definitions of “major accident”, “disaster” or “vulnerability”, nor risk assessment methodology)

18.2.4 Study Area

The study area for this assessment is the site of the proposed scheme, as illustrated in **Figure 1.1** in **Chapter 1, Introduction** and as described in **Section 2.5**, in **Chapter 2, Background and Need for the Scheme**.

18.2.5 Site Visits

Information from various specialist site visits were accumulated and reviewed in order to inform this assessment. A virtual site walkover was also undertaken.

18.2.6 Consultation

Refer to **Section 1.5** in **Chapter 1, Introduction** for information on the consultation undertaken.

18.2.7 Categorisation of the Baseline Environment

A desk-based study has been undertaken in order to establish the baseline environment on which the risk assessment is being carried out, as this will influence both the likelihood and the impact of a major accident and/or disaster.

As outlined in the guidance⁷, establishing the local and regional context prior to completion of the risk assessment enables a better understanding of the vulnerability and resilience of the area to emergency situations. **Section 18.3** provides an overview of the baseline environment that has been considered for this assessment.

18.2.8 Impact Assessment Methodology

18.2.8.1 Current Practice

As discussed above, the scope and methodology of this assessment is centred on the understanding that the proposed scheme will be designed, built and operated in line with best international current practice and, as such, the vulnerability of the proposed scheme to risks of major accidents and/or natural disasters is considered low.

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 **Chapter 13, Land and Soils** and **Chapter 14, Water** for further detail).

18.2.8.2 Site-Specific Risk Assessment Methodology

Overview

A site-specific risk assessment identifies and quantifies risks focusing on: unplanned, but possible and plausible events occurring during the construction and operation of the proposed scheme. The approach to identifying and quantifying risks associated with the proposed scheme by means of a site-specific risk assessment is derived from the EPA guidance⁶.

The criteria for categorising impact is derived from the DoEHLG guidance⁷ (Refer to **Table 18.2** and **Table 18.3**).

The following steps were undertaken as part of the site-specific risk assessment:

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

Risk Identification

Risks have been reviewed through the identification of plausible risks in consultation with relevant specialists. The identification of risks has focused on non-standard but plausible incidents that could occur at the proposed scheme during construction and operation.

In accordance with the European Commission Guidance³, risks are identified in respect of the projects:

- (1) Potential vulnerability to disaster risks; and
- (2) Potential to cause accidents and/or disasters.

Risk Classification

Classification of Likelihood

Having identified 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 18.2** 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, i.e. any risk to the proposed scheme less than extremely unlikely to occur has been excluded from the assessment.

Table 18.2 Risk Classification Table - Likelihood (Source DoEHLG7)

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. Further the Wicklow County Council Major Emergency Plan, if implemented as intended, would 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 18.3**.

The consequence of a risk to/from the proposed scheme 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 18.3 Risk Classification Table – Consequence (Source DoEHLG7)

Ranking	Consequence	Impact	Description
1	Minor	Life, Health, Welfare Environment Infrastructure	Small number of people affected; no fatalities and small number of minor injuries with first aid treatment. No contamination, localised effects <€0.5M

Ranking	Consequence	Impact	Description
		Social	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 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 DoEHLG⁷ guidance and as outlined in **Table 18.4**) indicates the critical nature of each risk. This risk matrix has therefore been applied to evaluate each of the risks associated with the proposed scheme. 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 18.4 Risk Matrix (Source DoEHLG7)

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

18.3 Baseline Conditions

According to the Wicklow County Council Major Emergency Plan, Wicklow County Council’s All Hazard Risk Assessment Process and the Eastern Region Major Emergency Planning Working Group recorded the following general and specific risks that may be faced in County Wicklow and within the Eastern Region:

1. Severe Weather
2. Mass Casualty/Crowd Incident
3. Industrial Accident/Seveso/Hazmat
4. Transport Incident
5. Terrorist Incident
6. Public Health
7. Loss of Utilities

Severe weather conditions pose one of the most common risks to Ireland and to the proposed scheme. In recent times there has been an increase in the number of severe weather events in the country, particularly those leading to flooding and flash flood incidents.

Arklow has experienced recurring flooding problems that have caused widespread damage to public and private property. The largest flood event recorded was in August 1986 resulting from extreme meteorological conditions commonly referred to as “Hurricane Charlie.” **Table 18. 5** is taken from the Wicklow County

Council Climate Adaptation Strategy (2019) and outlines the extreme weather events which have affected County Wicklow in recent years, including numerous flood events. Further localised flooding as a result of extreme weather events were recorded in Arklow in December 18989, October 2004 and October 2005.

Table 18. 5 Extreme Weather Events Which Affected County Wicklow (List Is Non- Exhaustive)
(Extract from The Wicklow County Council Climate Adaptation Strategy (2019))

EXTREME WEATHER EVENTS WHICH AFFECTED COUNTY WICKLOW (LIST IS NON- EXHAUSTIVE)										
YEAR	DATE	EVENT TYPE/ NAME	OUTLINE DESCRIPTION	CLIMATE EVENT						
				STRONG WINDS	EXTREME RAINFALL	HEAVY SNOWFALL/LOW TEMPS	SEA LEVEL RISE	DROUGHT	HEATWAVE	
2018	September	Storm Ali	Orange wind warning - gale force winds of up to 120km/h, stormy conditions.							
2018	Summer	High Temperatures Heat wave and Drought	High temperatures, heat wave and drought. Interruption to water supply due to lack of raw water storage. Gorse fires - power cuts. Emergency services deployed to fighting gorse fires.							
2018	February/ March	Storm Emma and Beast from the East	Blizzard / Heavy Snowfall / Widespread heavy snow drifting. Disruption to business, water supply, emergency services, power cuts etc.							
2017	21st October	Storm Brian	High Sea levels - Damage to Murrough north of Wicklow Town.							
2017	16th October	Storm Ophelia (Ex-Hurricane Ophelia)	Red warning - Gale Force winds, heavy rain and storm surges along some coasts (flooding). Disruption to business, power cuts etc. Damage to Murrough north of Wicklow Town. Risk to damage of Wexford - Dublin Rail Line.							
2016	January	Heavy Rain	Wettest January on record - 126% of monthly average.							

EXTREME WEATHER EVENTS WHICH AFFECTED COUNTY WICKLOW (<i>LIST IS NON- EXHAUSTIVE</i>)									
YEAR	DATE	EVENT TYPE/ NAME	OUTLINE DESCRIPTION	CLIMATE EVENT					
				STRONG WINDS	EXTREME RAINFALL	HEAVY SNOWFALL/LOW TEMPS	SEA LEVEL RISE	DROUGHT	HEATWAVE
2015	December	Storm Frank	Orange Wind Warning - Roads impassable - Murrrough Damaged - Landslide in Wicklow Town.						
2015	November	Storm Barney	Short-term gale-force winds. Damage to Wicklow swimming pool roof and Rathnew GAA Clubhouse roof. Widespread water outages due to power cuts.						
2014	12th February	Storm Darwin	Orange warning for strong winds - classified as a 1 in 20-year event.						
2014	5th January	Storm Christine	Orange Warning - High Tides and coastal flooding.						
2013 / 2014	Winter	Winter Storms	Winter Storms - serious coastal damage and widespread, persistent flooding. West Wicklow badly hit with a large number of trees down.						
2011	24th October	Heavy Rain and Flooding	Heavy Rain in County Wicklow. 66mm in 9 hours in Casement Aerodrome approaching 1 in 100-year probability event. Extreme flooding caused.						
2010	November / December	Winter Cold Spell	Lowest Temperatures on record in Dublin Airport (-8.4oC)						
2009 / 2010	Winter	Winter Cold Spell	Coldest Winter in almost 50 years according to Met Éireann.						
2009	November	Severe Flooding	Rainfall totals were highest on record, extensive flooding.						
2008	August	Heavy Rain and Flooding	Heavy rain and extensive flooding.						
2006	Summer	High Temperatures and Heat wave.	Warmest Summer since record breaking 1996						

EXTREME WEATHER EVENTS WHICH AFFECTED COUNTY WICKLOW (<i>LIST IS NON- EXHAUSTIVE</i>)									
YEAR	DATE	EVENT TYPE/ NAME	OUTLINE DESCRIPTION	CLIMATE EVENT					
				STRONG WINDS	EXTREME RAINFALL	HEAVY SNOWFALL/LOW TEMPS	SEA LEVEL RISE	DROUGHT	HEATWAVE
2002	14th November	Heavy Rain and Severe Flooding	Severe flooding in Eastern Areas. Wettest month on record at Casement Aerodrome.						
2002	1st February	Coastal Flooding	Eastern and Southern coasts - highest tide in 80 years.						
2000	5th November	Severe Flooding	11-112mm rainfall Wicklow/Dublin						
1997	24th December	Windstorm	Windstorm						
1995	Summer	High Temperatures Heat wave and Drought	Warmest Summer on record. Mean temperatures over 20C above normal. Temp rises to 30deg C over a number of consecutive days.						
1993	11th November	Severe Flooding	In excess of 100mm of rain in 24-hour period in East and Midlands.						
1987	12th 13th January	Heavy Snowfall	12 - 19mm snow in the East and Midlands.						
1986	August	Hurricane Charlie	Strong winds and rain, worst flooding in 100 years.						

There are two Industrial sites within Arklow, which are subject to Industrial Emissions Directive ('IE') Licences from the EPA:

- Avoca River Park Limited – located approximately 2.5km upstream of the proposed development adjacent to the Avoca River; and
- Sigma-Aldrich Ireland Limited – located approximately 1.2km from the proposed development site on Vale Road adjacent to the M11 flyover and close to the Avoca River.

The Sigma Aldrich facility is also designated as a 'Seveso site', in accordance with Council Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances. This classification as a 'Seveso site' identifies the facility as an industrial establishment where dangerous substances are used or stored in large quantities. The occurrence of a major emission, fire or explosion resulting from a Seveso site has the potential to give rise to a major accident or disaster, immediate or delayed, inside or outside the establishment, and involving one or more dangerous substances.

18.4 Characteristics of the Proposed Development

- **Design:** The proposed development has been designed in line with best international current practice which have incorporated health and safety considerations.
- **Operation:** The operational phase of proposed development will be managed to minimise the risk of major accidents occurring. Refer to **Section 4.6.2** of **Chapter 4, Description of the Proposed Development** for information on maintenance and management of the proposed development.
- **Construction:** The construction phase of the proposed development will be carried out in accordance with all relevant health and safety guidance and legislation, as well as the provisions of the CEMP. Refer to **Chapter 5, Construction Strategy** and **Appendix 5.1**.

18.5 Risk Assessment

This section outlines the possible risks associated with the proposed development for the construction phase and operational phase.

These risks have been assessed in accordance with the relevant classification (Refer to **Table 18.2** and **Table 18.3**).

As outlined in **Section 18.2.7**, 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.

18.5.1 Potential Effects During Construction

A risk register has been developed which contains all the potential, relevant risks identified during the construction phase of the proposed development. These are presented in **Table 18.6**.

Based on the understanding that the construction phase of the proposed development will be carried out in accordance with construction best-practice, all relevant health and safety guidance and legislation, the mitigation measures outlined in this EIAR, as well as the provisions of the CEMP, a number of the potential risks identified have been disregarded from further assessment. Where potential risks are not identified for further assessment, a statement as to why is included in **Table 18.6**.

Table 18.6 Risk register - construction

Risk ID	Potential Risk	Possible Cause	Requirement for further assessment?
Potential vulnerability to accidents and/or disasters			
A	Flooding of site/ working areas during construction works	Periods of extended rainfall	No. The potential for the proposed scheme to be affected by flooding during construction is considered in

Risk ID	Potential Risk	Possible Cause	Requirement for further assessment?
			Chapter 14 'Water' and in the CEMP, see Appendix 5.1
B	Fire in Arklow Town Marsh	Periods of extreme drought and heat	Yes.
Potential to cause major accidents and/or disasters			
C	Arklow Bridge collapse	<ul style="list-style-type: none"> Underpinning of the bridge piers and abutments (including grouting); Collision of machinery with bridge piers; Demolition of existing scour protection of the bridge piers; and Repairs to the masonry work of the older section of the bridge. 	Yes
D	Traffic accidents resulting from construction phase traffic or temporary construction traffic management measures	<ul style="list-style-type: none"> HGVs navigating roundabout at 1 Ferrybank Machinery navigating riverbank and slopes Driver error- not abiding by traffic re-routing or road closures 	No. The construction phase of the proposed development will be carried out in accordance with best practise construction methodologies, all relevant health and safety guidance and legislation, as well as the provisions of the CEMP, see Appendix 5.1.
E	Contamination of the groundwater/ surface water	Spill or leakage of oils or hydrocarbons from construction machinery and vehicles	No. The construction phase of the proposed development will be carried out in accordance with best practise construction methodologies, all relevant health and safety guidance and legislation, as well as the provisions of the CEMP, see Appendix 5.1.
F	Falling debris from construction vehicles/ scaffolding/hydraulic platforms	Contractor error	No. The construction phase of the proposed development will be carried out in accordance with best practise construction methodologies, all relevant health and safety guidance and legislation, as well as the provisions of the CEMP, see Appendix 5.1.
G	Collapse of scaffolding/hydraulic platforms used for masonry of Arklow Bridge	<ul style="list-style-type: none"> Storms/Gale force winds 	No. The construction phase of the proposed development will be carried out in accordance with best practise construction methodologies,

Risk ID	Potential Risk	Possible Cause	Requirement for further assessment?
			all relevant health and safety guidance and legislation, as well as the provisions of the CEMP, see Appendix 5.1.
H	Sinking/flooding of plant or machinery in River	<ul style="list-style-type: none"> • Unsuitable ground conditions/contractor error in construction of temporary causeways • Flash flooding • Failure of bunds 	No. The construction phase of the proposed development will be carried out in accordance with best practise construction methodologies, all relevant health and safety guidance and legislation, as well as the provisions of the CEMP, see Appendix 5.1.

The potential construction phase risks identified for further assessment include: B 'Fire in Arklow Town Marsh', C 'Arklow Bridge Collapse'.

18.5.2 Potential Effects during Operation

A risk register has been developed which contains all the potential, relevant risks identified during the operational phase of the proposed development. These are presented in **Table 18.7**.

Based on the understanding that the proposed development will be designed, built and operated in line with best international current practice, and will be compliant with all relevant Health and Safety and Fire regulation and guidance, as well as the mitigation measures outlined in this EIAR, a number of the potential risks identified have been disregarded from further assessment.

Where potential risks are not identified for further assessment, a statement as to why is included in **Table 18.7**.

Table 18.7 Risk register - operation

Risk ID	Potential Risk	Possible cause	Requirement for further assessment?
Potential vulnerability to accidents/ disasters			
J	Flooding of site	Periods of extended rainfall	No. The potential for the proposed scheme to be affected by flooding during construction is considered in Chapter 14 'Water'.
K	Fire in Arklow Town Marsh	Periods of extreme drought and heat	Yes
L	Incident at nearby SEVESO site resulting in off-site environmental effects	Operational error	Yes
Potential to cause accidents and / or disasters			

Risk ID	Potential Risk	Possible cause	Requirement for further assessment?
M	Public safety along River Walk or in the open space.	<ul style="list-style-type: none"> • Human error/accident-slipping/falling • Acts of crime 	No. The potential for the proposed scheme to negatively affect the population and users of the scheme is considered in Chapter 16 'Population and Human Health'.

The potential operational phase risks identified for further assessment include: J: 'Fire in Arklow Town Marsh' and K 'Incident at nearby SEVESO site resulting in off-site environmental effects.'

These risks have been assessed in accordance with the relevant classification (Refer to **Table 18.2** and **Table 18.3**) and the resulting risk analysis is given in **Table 18.8**.

The risk register is based upon possible risks associated the proposed development. As outlined in **Section 18.2.7**, 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.

Table 18.8 Risk Assessment

Risk ID	Potential Risk	Possible cause	Environmental effect	Likelihood Rating	Consequence Rating	Risk Score (Consequence x Likelihood)
Construction						
Potential vulnerability to disaster risks						
B	Fire in Arklow Town Marsh	Periods of extreme drought and heat	Damage to sensitive ecosystems. Loss of biodiversity. Threat to property and life. Air quality.	2	2	4
<p>Basis of Likelihood: The occurrence of a fire in Arklow Town Marsh is considered ‘very unlikely’ to occur in that it ‘<i>is not expected to occur</i>’ and there are ‘<i>very few incidents in associated organisations, facilities or communities</i>’ Marsh fires can be man-made or occur naturally, as a result of extreme temperatures. While the risk of a wildfires occurring due to extreme weather are currently low in Ireland, there is a higher risk of wildfires occurring in Ireland in the summer months, with global temperatures increasing. A marsh fire occurred in Arklow Town Marsh in 2008, resulting in the destruction in wildlife.</p> <p>Basis of Consequence: Should a wildfire occur in Arklow Town Marsh, the consequence is considered to be limited in that, while biodiversity, air and water quality would be affected, there would be ‘simple contamination, localised effects of short duration.’</p>						
Potential to cause major accidents and/or disasters						
C	Arklow Bridge collapse	<ul style="list-style-type: none"> Underpinning of the bridge piers and abutments (including grouting); Demolition of existing scour protection of the bridge piers; and Repairs to the masonry work of the older section of the bridge. 	Human injury or loss of life.	2	3	6
<p>Basis of Likelihood: The risk of bridge collapse during the underpinning of Arklow Bridge is considered ‘very unlikely’. Section 4.4.2 of Chapter 4 Description of the Proposed Scheme outlines the steps that will be followed during the underpinning process including “<i>Previous studies have been carried out on the lateral capacity and the load bearing capacity of Arklow Bridge. These studies found that the bridge was in a structurally sound condition, able to withstand lateral forces from a 100-year fluvial flood event in the absence of a flood relief scheme and safely carry the expected traffic loads. The detailed design of the underpinning will take account of bridge lateral stability under flood flow conditions, as well as overall structural stability, in the context of reduced flood levels upstream reducing the lateral forces, reduced bridge floor level, new pier foundations taken to suitable formation levels</i></p>						

Risk ID	Potential Risk	Possible cause	Environmental effect	Likelihood Rating	Consequence Rating	Risk Score (Consequence x Likelihood)
<p>and all available ground investigation data. The improved flood conditions, robust design and proposed construction methodology as set out in Chapter 5 – Construction Strategy will ensure that the structural integrity of Arklow Bridge is enhanced.”</p> <p>Basis of Consequence: In the event of the collapse of Arklow Bridge, a ‘serious’ consequence is envisaged in that a ‘significant number of people’ would be affected, with the potential for “multiple serious or extensive injuries”. The community would also be only “partially functioning” as a result.</p>						
Operation						
Potential vulnerability to accidents/ disasters						
K	Fire in Arklow Town Marsh	Periods of extreme drought and heat	Damage to sensitive ecosystems. Loss of biodiversity. Threat to property and life. Air quality.	2	2	4
<p>Basis of Likelihood: The occurrence of a fire in Arklow Town Marsh is considered ‘very unlikely’ to occur in that it ‘is not expected to occur’ and there are ‘very few incidents in associated organisations, facilities or communities’ Marsh fires can be man-made or occur naturally, as a result of extreme temperatures. While the risk of a wildfires occurring due to extreme weather are currently low in Ireland, there is a higher risk of wildfires occurring in Ireland in the summer months, with global temperatures increasing. A marsh fire occurred in Arklow Town Marsh in 2008, resulting in the destruction in wildlife.</p> <p>Basis of Consequence: Should a wildfire occur in Arklow Town Marsh, the consequence is considered to be limited in that, while biodiversity, air and water quality would be affected, there would be ‘simple contamination, localised effects of short duration.’</p>						
L	Incident at nearby SEVESO site resulting in off-site environmental effects	Operational error	Damage to sensitive ecosystems. Loss of biodiversity. Threat to property and life. Air quality.	1	3	3
<p>Basis of Likelihood: The closest licensed site to the proposed development is a ‘Seveso site’ - the Sigma Aldrich facility at Vale Road, Arklow. Having regards to the sites Annual Environmental Reports (AER’s) for the previous 5 years, it can be determined that any incidents that have been reported at the site in previous years have been minor in nature. The possibility of an incident occurring that will result in a significant negative impact on the proposed development, resulting in a major accident and/or disaster is considered ‘extremely unlikely’ in that it ‘may occur only in exceptional circumstances; once every 500 or more years’</p> <p>The Sigma Aldrich facility is a lower tier Seveso site and COMAH requires them to prepare an Internal Emergency Plan which details both the systems that exist to deal with various emergencies and the response expected The site is also required to prepare a safety report and major accident prevention policy, and is subject to regular inspections from the Health and Safety Authority.</p>						

Risk ID	Potential Risk	Possible cause	Environmental effect	Likelihood Rating	Consequence Rating	Risk Score (Consequence x Likelihood)
<p>According to the sites Environmental Liabilities Risk Assessment, the facility is well managed in terms of environmental controls. Risks that were identified as ‘high severity’ risks were identified to occur on a low to infrequent basis as a result of the management and design of the site, thus resulting in an overall low risk score.</p> <p>Having regard to the mechanisms in place to mitigate and avoid any major accident or incident at the Sigma Aldrich site, the comprehensive range of emergency response procedures in place in the event of these occurring, as well as the outcome of the sites ELRA, it is considered that the likelihood of a major incident occurring at the Sigma Aldrich facility which will significantly impact the proposed development will be very unlikely.’</p> <p>Basis of Consequence: According to the Health and Safety Authority, ‘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. In Europe, a catastrophic accident in the Italian town of Seveso in 1976 prompted the adoption of legislation on the prevention and control of such accidents’.</p>						

This risk assessment in **Table 18.9** categorises each of the potential risks by their ‘risk score’. A corresponding risk matrix is provided in **Table 18.10** which is colour coded in order to provide an indication of the critical nature of each risk. As outlined in **Section 18.2.7.2**, the red zone represents ‘high risk scenarios’, the amber zone represents ‘medium risk scenarios’ and the green zone represents ‘low risk scenarios.’

Table 18.9 Risk Scores

Risk ID	Potential Risk	Likelihood Rating	Consequence Rating	Risk Score
Construction Phase				
B	Fire in Arklow Town Marsh	2	2	4
C	Arklow Bridge Collapse	2	3	6
Operational Phase				
K	Fire in Arklow Town Marsh	2	2	4
L	Incident at nearby SEVESO site	1	3	3

Table 18.10 Risk Matrix

Likelihood Rating	Very likely	5					
	Likely	4					
	Unlikely	3					
	Very unlikely	2		B, J	C		
	Extremely Unlikely	1			K		
			Minor	Limited	Serious	Very Serious	Catastrophic
			1	2	3	4	5
Consequence Rating							

18.6 Likely Significant Effects

18.6.1 Do-Nothing Scenario

In the do-nothing scenario, the potential risk of the proposed scheme causing, or being affected by a major accident and/or disaster would be eliminated as the proposed Arklow FRS would not be implemented.

It should be noted however, that under the Do-Nothing Scenario, the recurring flooding problems in Arklow would continue. As previously outlined, floods can devastate homes, commercial buildings, agricultural lands, public infrastructure and other physical properties. Tangible damages arising from flood events include direct damage to residential and non-residential properties, the cost of emergency services and damage to infrastructure and utility assets.

Intangible damages are related to the stress, anxiety and ill health caused to individual residents, during and after a flood event.

Individuals also incur indirect costs due to flooding of their properties that are not directly related to damage, such as evacuation, temporary accommodation, loss of earnings, increased travel and shopping costs. Further, there are increased liabilities and premium costs for insurance in vulnerable areas at risk of flooding.

Thus, the do-nothing scenario of the proposed scheme is likely to result in a significant negative effect on the risk of major accidents/disasters in Arklow.

18.6.2 Construction Phase

From examining the plausible risks presented in **Table 18.8**, the scenario with the highest risk score in terms of a major accident and/or disaster during the construction phase of the proposed development was identified as being ‘Arklow Bridge collapse.’

The risk of Arklow Bridge collapse during construction was given a risk score of 6 indicating a scenario that is ‘very unlikely’ to occur, and which would have ‘serious’ consequences should it do so. According to the risk matrix provided in **Table 18.10**, this is indicative of a ‘low risk scenario.’

18.6.3 Operational Phase

From examining the plausible risks presented in **Table 18.8**, the scenario with the highest risk score in terms of a major accident and/or disaster during the operational phase of the proposed development was identified as being ‘Fire in Arklow Town Marsh.’

The risk of a fire occurring in Arklow Town Marsh during construction was given a risk score of 4 indicating a scenario that is ‘very unlikely’ to occur, and which would have ‘limited’ consequences should it do so. According to the risk matrix provided in **Table 18.10**, this is indicative of a ‘low risk scenario.’

18.6.4 Indirect Effects

By their nature, major accidents and/or disasters have the potential to give rise to indirect effects such as effects on the economy, tourism, transport, human health etc.

As outlined in **Section 18.5.2** and **18.5.3**, no likely risks of a major accident/disaster occurring are identified in respect of the proposed development. Thus, no indirect effects are identified.

18.6.5 Cumulative Effects

This section includes an assessment of the potential for likely significant direct and indirect cumulative effects of projects listed in **Table 20.2** in **Chapter 20**, *Cumulative Impacts and Interaction of Effects* in combination with the proposed scheme.

It also includes an assessment of the potential for likely significant direct and indirect cumulative effects of all projects listed in **Table 20.2** in **Chapter 20, Cumulative Impacts and Interaction of Effects** taken together in combination with the proposed scheme.

Due to the location and nature of the following projects, as well as the low likelihood of the proposed scheme giving rise to major accidents or disasters, the following projects were considered not to have the potential to give rise to cumulative effects on major accidents or disasters:

- Action Health Enterprises GP Limited The Former Boland's Builders Providers, Castle Park (181170)
- Frank & Sandra Duffy No 7 and 8 Bridge Street &, No 34 Main Street (19750)
- Gaines Europe Ltd Unit 1A Lower Tinahisk, South Quay (16248)
- Gaines Europe Ltd Tinahask Lower, South Quay (16414)
- Irish Water Arklow, Co. Wicklow (SI201801)
- Joby Developments North Quay, Arklow (15857)
- Mill Sea Ltd North Quay, Arklow (18316)
- Wicklow County Council Inner Harbour / Dock, Off South Quay (20469)
- Arklow, Co. Wicklow- Pre-Application (306662)
- Parade Ground- WCC Part 8
- FS007049 Sure Partners Site Investigations at Arklow Bank

The following projects were considered to have the potential to give rise to cumulative effects on major accidents or disasters, when considered with the proposed scheme and were therefore assessed in further detail:

- Circle K Safeway Service Station (20426)
- Crag Digital Avoca Limited (201285)

Circle K Safeway Service Station (20426)

This project relates to the demolition of the existing, and construction of a new, fuel forecourt at the existing Circle K service station, which is located immediately adjacent to Arklow Town Marsh and SC1 of the proposed scheme. This Circle K project involves development of over ground and underground fuel infrastructure, which carries with it risk of fire or explosion. Arklow Town Marsh can be subjected to fire in periods of extreme heat or drought. Having regard to the potential risks associated with the proposed scheme, which includes the risk of Marsh fire, there is a potential for a cumulative risk of a major accidents or disaster occurring as a result of the development of this project. However, given the low likelihood of a fire occurring in the Marsh, and having regard to the safety procedures which will be required to be carried out during the construction phase of this project, no likely cumulative effect is identified.

Crag Digital Avoca Limited (201285)

According to the EIAR for this development, the risk of a major accident or disaster from the site has been assessed to be very low. A comprehensive set of emergency plans and procedures would be produced for the Proposed Development in accordance with The Safety, Health and Welfare at Work Act 2005, including a fire safety risk assessment. The design of the Proposed Development has incorporated features to minimise scenarios and prevent harm in the event of a major accident or disaster. Thus, having regard to the low likelihood of major accidents or disasters occurring at this development and the proposed scheme, no negative likely significant direct, indirect cumulative effects are identified with regards major accidents and disasters.

All projects taken together in combination with the proposed scheme

Overall, taking all of the projects together in-combination with the proposed scheme, there is not considered to be any cumulative risk of major accidents and disasters occurring during the construction and operational phase due to the nature of the proposed scheme and its proximity to other projects.

18.7 Mitigation Measures and Monitoring

18.7.1 Construction Phase

The appointed contractor's proposed method and sequence of working will be highly critical in maintaining the overall stability of the bridge and the appropriate stipulations will be incorporated into all tender and construction documents to make sure this process is adhered to.

18.7.2 Operational Phase

No mitigation or monitoring measures are proposed specific to reducing the risk of major accident/disaster during operation.

18.8 Residual Effects

The risk of a major accident and/or disaster occurring during either the construction or operational phases of the proposed development is considered low.

18.9 References

Control of Major Accident Hazards Involving Dangerous Substances Regulations 2006, as amended (S.I. No. 209 of 2015), implementing the Seveso II Directive (96/82/EC)

Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations (OJ L 172, 2.7.2009, p. 18).

Department of Agriculture, Food and Marine (2013) *Wildfire Prevention- Advice for the General Public*

Department of Defence. (2017). *A National Risk Assessment for Ireland 2017*

Department of Environment, Heritage and Local Government. (2010) *A Guide to Risk Assessment in Major Emergency Management*

Directive 2012/18/EU of the European Parliament and the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC (OJ L 197, 24.7.2012, p. 1).

DoEHLG (2010) *A Guide to Risk Assessment in Major Emergency Management*

Wicklow County Council. (2017). *Major Emergency Plan*

Electricity Supply Board (2008) *Code of Practice for Avoiding Danger from Overhead Electricity Lines*

Environmental Protection Agency. (2014). *Guidance on Assessing and Costing Environmental Liabilities*

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EPA (2014) *Guidance on Assessing and Costing Environmental Liabilities*

European Commission. European Forest Fire Information System (EFFIS). Available at:
http://effis.jrc.ec.europa.eu/static/effis_current_situation/public/index.html
(Accessed 21/09/18)

Government of Ireland (2006) *A Framework for Major Emergency Management*

IEMA (2020) *Major Accidents and Disasters in EIA – A Primer*