

## 20 MAJOR ACCIDENTS AND DISASTERS

### 20.1 Introduction

This chapter describes the proposed development in respect of its potential vulnerability to major accidents/disasters, and its potential to give rise to the same.

The assessment is carried out in compliance with the EIA Directive on the assessment of the effects of *certain public and private projects on the environment*<sup>1</sup> that entered into force on 16<sup>th</sup> May 2017 which states the need to assess:

*“the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned”*

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 relevant legal requirements, this chapter seeks to determine:

- The relevant disasters, if any, that the proposed development could be vulnerable to;
- The relevant major accidents, if any, that the proposed development could give rise 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.

This assessment was undertaken by Clodagh O’Donovan of Arup. Clodagh holds a Bachelor of Engineering and MEng Sc and is the Planning Service Team Lead for Arup Ireland. Clodagh has significant experience in the management and delivery of complex multidisciplinary projects, with particular experience in the EIA, AA and statutory consent process.

Please refer to Chapter 1 for further details on her relevant qualifications and experience.

### 20.2 Assessment Methodology

#### 20.2.1 General

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

The scope and methodology presented in the following sections is based on the provisions of the EIA Directive<sup>1</sup>, the draft EPA Guidelines<sup>2</sup>, EU Commission guidance<sup>3</sup> and other published risk assessment methodologies as described in **Section 20.2.6**, as well as 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 20.2.6** for further detail on this approach).

The assessment of the risk of major accidents and/or disasters 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.

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<sup>1</sup> Directive 2014/52/EU of the European Parliament and the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

<sup>2</sup> Environmental Protection Agency. (2017). *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*

<sup>3</sup> European Commission (2017). *Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report*. Luxembourg.

## 20.2.2 Guidance and Legislation

### 20.2.2.1 Legislative Requirements

The following paragraphs set out the requirements of the EIA Directive<sup>1</sup> in relation to major accidents and/or disasters and their implementation in the Irish statutory code.

Recital 15 of the EIA Directive<sup>1</sup> 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 Council and Council Directive 2009/71/Euratom, or through relevant assessments carried out pursuant to national legislation provided that the requirements of this Directive are met.”*

It is clear from the EIA Directive<sup>1</sup> that a major accident and/or disaster assessment is most readily applied to ‘Control of Major Accident Hazards involving Dangerous Substances’ (COMAH)<sup>4</sup> sites or major industrial/energy installations. Notwithstanding, the assessment of major accidents and disasters for the proposed development has been carried out for completeness given the strategic nature of the proposed development.

Article 3 of the EIA Directive<sup>1</sup> 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<sup>1</sup> 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”.*

Article 94 and paragraph 2 of Schedule 6 of the Planning and Development Regulations 2001, as amended, which implement the provisions of the EIA Directive, requires the following information to be provided, where relevant to the specific characteristics of the development or type of development concerned and to the environmental features likely to be affected:

*“(h) a description of the expected significant adverse effects on the environment of the proposed development deriving from its vulnerability to risks of major accidents and/or disasters which are relevant to it. Relevant information available and obtained through risk assessments pursuant to European Union legislation such as the Seveso III Directive or the Nuclear Safety Directive or relevant assessments carried out pursuant to national legislation may be used for this purpose, provided that the requirements of the Environmental Impact Assessment 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, emergencies arising from such events.”*

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<sup>4</sup> Government of Ireland (2015) Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015

### 20.2.2.2 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.

- Environmental Impact Assessment of Projects- Guidance on the preparation of the Environmental Impact Assessment Report (2017)<sup>3</sup>
- Draft EPA Guidelines (2017)<sup>2</sup>
- Guidance on Assessing and Costing Environmental Liabilities (2014)<sup>5</sup>
- A Framework for Major Emergency Management Guidance Document 1-A Guide to Risk Assessment in Major Emergency Management (2010)<sup>6</sup>
- A National Risk Assessment for Ireland 2017 (2017)<sup>7</sup>
- Dublin City Council Major Emergency Plan (2015)<sup>8</sup>
- A Guide to Risk Assessment in Major Emergency Management (2010)<sup>9</sup>

### 20.2.3 Study Area

The study area for this assessment is the site of the proposed development in its entirety, as described in Chapter 3, Description of Proposed Development.

### 20.2.4 Consultation

Chapter 1, Introduction details the consultation process which was carried out as part of the proposed development. No consultation specific to this assessment was undertaken.

### 20.2.5 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 based, as this will influence both the likelihood and the impact of a major accident and/or disaster.

As outlined in the guidance<sup>5</sup>, 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 20.3** provides an overview of the baseline environment that has been considered for this assessment.

### 20.2.6 Impact Assessment Methodology

#### 20.2.6.1 Current Practice

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

Current EIA practice already includes an assessment of some potential accidents and disaster scenarios such as pollution incidents (e.g. spills) to ground and watercourses as well as assessment of flooding events. These are described in detail in the relevant EIAR assessment chapters (refer to **Chapters 14, Water, Chapter 15, Land and Soils and Chapter 16, Hydrogeology** for further detail).

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<sup>5</sup> Environmental Protection Agency. (2014). *Guidance on Assessing and Costing Environmental Liabilities*

<sup>6</sup> Government of Ireland (2006) *A Framework for Major Emergency Management*. Dublin, Ireland.

<sup>7</sup> Department of Defence (2017) *A National Risk Assessment for Ireland 2017*. Dublin, Ireland.

<sup>8</sup> Dún Laoghaire-Rathdown County Council (2017) Major Emergency Plan. Dublin, Ireland

<sup>9</sup> DoEHLG (2010) *A Guide to Risk Assessment in Major Emergency Management*. Dublin Ireland.

## 20.2.6.2 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 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<sup>2</sup>.

The criteria for categorising impact is derived from the DoEHLG guidance<sup>9</sup> (Refer to Table 20.1 and Table 20.2).

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

The identification of plausible risks has been carried out in consultation with relevant specialists. A Risk Register which was prepared during the design of the proposed development was also reviewed in order to inform the identification of risks for this assessment. The identification of risks has focused on non-standard but plausible incidents that could occur at the proposed development during construction and operation.

In accordance with the European Commission Guidance<sup>3</sup> risks are identified in respect of the developments:

- (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 20.1 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, i.e. any risk to the proposed development less than extremely unlikely to occur has been excluded from the assessment.

The likelihood rating assigned to each risk has assumed that all proposed mitigation measures and/or safety procedures are in place and have succeeded in reducing or preventing the major accident and/or disaster occurring.

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.

**Table 20.1:** Risk Classification Table- Likelihood (Source DoEHLG)9

### *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 occurring. Further the Dublin City Major Emergency Plan8, 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 20.2.

The consequence of a risk to 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.

Ranking	Consequence	Impact	Description
1	Minor	Life, Health, Welfare Environment Infrastructure Social	Small number of people affected; no fatalities and small number of minor injuries with first aid treatment. No contamination, localised effects <€0.5M Minor localised disruption to community services or infrastructure (<6 hours).
2	Limited	Life, Health, Welfare Environment Infrastructure Social	Single fatality; limited number of people affected; a few serious injuries with hospitalisation and medical treatment required. Localised displacement of a small number of people for 6-24 hours. Personal support satisfied through local arrangements. Simple contamination, localised effects of short duration €0.5-3M

Ranking	Consequence	Impact	Description
			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.

**Table 20.2:** Risk Classification Table – Consequence (Source DoEHLG)9

### 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 DoEHLG9 guidance and as outlined in Table 20.3 indicates the critical nature of each risk. This risk matrix has therefore been applied to evaluate each of the risks associated with the proposed development. 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’.

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

**Table 20.3** Risk Matrix (Source DoEHLGError! Bookmark not defined.)

**20.3 Baseline Conditions**

**20.3.1 Vulnerability to Major Accidents/Disasters**

Observations show that Ireland’s climate is changing, and the observed scale and rate of change is consistent with regional and global trends. Ireland’s geographic position means it is less vulnerable to disasters such as earthquakes or tsunamis, which might pose risk to developments of this nature and scale in other locations. However, 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.

Indeed, sea level rise is already being observed and is projected to continue to rise into the future, which will increase both flood and erosion risk to our coastal communities and infrastructural assets, as well as threaten coastal squeeze of inter-tidal habitats. In addition, it is projected that the number of heavy rainfall days per year may increase, which could lead to an increase in flooding incidents.

The site of the proposed development is located in close proximity to the River Liffey. As outlined in Chapter 13, Water, there is a risk of fluvial and tidal/coastal flooding from the River Liffey along the southern boundary of the site.

This determination was made following the examination of the OPW’s Preliminary Flood Risk Assessment (PFRA)<sup>10</sup> mapping available to view on [www.myplan.ie](http://www.myplan.ie) and the pluvial flood depth map produced as part of the “FloodResilientCity Project” included in the Dublin City Council Development Plan 2016-2022<sup>11</sup>. Both of these maps indicate that there is potential for pluvial flooding in the study area.

<sup>10</sup> The National Preliminary Flood Risk Assessment (PFRA) Overview Report (2012) <http://www.cfram.ie/wordpress/wp-content/uploads/2013/06/PFRA-Main-Report.pdf> [Accessed: October 2018]

<sup>11</sup> Dublin City Council, 2016. Dublin City Development Plan 2016-2022. <http://www.dublincity.ie/main-menu-services-planning-city-development-plan/dublin-city-development-plan-2016-2022> [Accessed: March 2019]

As the site is in close proximity to the River Liffey it can be expected that there will be hydraulic connectivity between groundwater levels and tidal levels. As the existing ground levels are higher than the tidal levels the risk of groundwater flooding is considered to be low.

Further vulnerabilities of the proposed development site to major accidents/ disasters include political unrest and terrorism. Over the past few years, conversations around these risks to Ireland and the Irish response capacity have increased. The Government of Ireland published the National Risk Assessment 2019: Overview of Strategic Risks<sup>12</sup> in August 2019, providing an opportunity for the identification, discussion and consideration of risks facing Ireland over the short, medium and long term.

The National Risk Assessment 2019<sup>12</sup> highlights the continued risk to Ireland from international terrorism. Like other countries, Ireland and its citizens has the potential to be negatively affected by terrorist incidents, depending on the location of such incidents and their wider impact.

Further, the National Risk Assessment 2019 was one of the first official acknowledgments of the risks posed by a potential Brexit. According to the report, a no deal Brexit has the potential to become a focus for increased loyalist paramilitary recruitment and activity, including in response to dissident republican paramilitary actions and an increased public focus on a border poll.

It is worth noting that the current COVID-19 pandemic, while it (and all such pandemics) represents a strategic risk at a national level, is not considered one which the proposed development is particularly vulnerable to, from a major accident/disaster perspective.

### 20.3.2 Potential to Give Rise to Major Accidents

According to the most up-to-date *Dublin City Council Major Emergency Plan*<sup>13</sup> (DCC, 2015), there have been four incidents in Dublin over the last three decades which caused either loss of life, structural damage or economic disruption and were declared as Major Emergencies. These incidents were the fire in the Stardust nightclub (Artane: 1981), the building collapse at Raglan House (Ballsbridge: 1987); the coastal flood event that affected large areas of the city in November 2002 and the pluvial/ fluvial flooding that affected large parts of the city in October 2011.

Any development which will accommodate a large number of people has the potential to give rise to major accidents.

## 20.4 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 20.1 and Table 20.2).

As outlined in Section 20.2.7, 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.

### 20.4.1 Assessment of 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 20.4.

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

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<sup>12</sup> Government of Ireland (2019) *National Risk Assessment 2019: Overview of Strategic Risks*. Statutory Office, Dublin

<sup>13</sup> Dublin City Council (2015) *Dublin City Major Emergency Plan*. Dublin, Ireland.

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 20.4.

Risk ID	Potential Risk	Possible Cause	Requirement for further assessment?
<b>Potential vulnerability to accidents and/or disasters</b>			
A	Flooding of site	Proximity to the River Liffey. Extreme weather- periods of heavy rainfall, taking into account climate change, strong winds and tidal events	No.  The proposed development will have no impact on floodplain storage and conveyance and will also not increase flood risk off site during construction. Earthworks operations shall be carried out such that surfaces shall be designed with adequate falls, profiling and drainage to promote safe run-off and prevent ponding and flooding.  Refer to findings of the Flood Risk Assessment, <b>Appendix 14.1</b> for the proposed development.
<b>Potential to cause major accidents and/or disasters</b>			
B	Fire/Explosion	<ul style="list-style-type: none"> <li>• Damage to unmapped services/utilities during earth works</li> <li>• Vehicle and vehicle collision</li> </ul>	No. 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.
C	Quay wall/upper quay wall collapse (i.e. river wall)	<ul style="list-style-type: none"> <li>• Excavation/piling associated with the construction phase of the proposed development</li> </ul>	Yes
D	Unplanned outages/ disruption to services	Damage to unmapped services/utilities during earth works	No. Disruption to services not considered to constitute a 'major accident or disaster' for the purposes of this assessment.
E	Road traffic accidents resulting from construction phase traffic or temporary	<ul style="list-style-type: none"> <li>• Driver error</li> <li>• Object on road</li> <li>• Failure of vehicle control systems</li> <li>• Public confusion</li> </ul>	No. 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

Risk ID	Potential Risk	Possible Cause	Requirement for further assessment?
	construction traffic management measures		provisions of the CEMP, see <b>Appendix 4.1.</b>
F	Contamination of the groundwater/ surface water	Construction phase spills or leakages	No. The construction phase of the proposed development will be carried out in accordance with construction best-practise and provisions of the CEMP. See <b>Appendix 4.1.</b>
G	Falling debris from construction vehicles/cranes or cranes striking luas overhead cables or poles	<ul style="list-style-type: none"> <li>• Inadequate securing</li> <li>• Overloading of vehicles</li> </ul>	Yes.
H	Release of asbestos fibres to atmosphere or surface water	<ul style="list-style-type: none"> <li>• Inadequate handling and removal of Asbestos Containing Materials (ACMs)</li> <li>• Removal of un-surveyed ACM</li> </ul>	No. The construction phase of the proposed development will be carried out in accordance with construction best-practise and provisions of the CEMP. See <b>Appendix 4.1.</b>

**Table 20.4** Risk Register- Construction Phase

The potential construction phase risks identified for further assessment include: C ‘Quay wall/upper quay wall collapse’ (i.e. the river wall) and G ‘Falling debris from construction vehicles/cranes or cranes striking Luas overhead cables or poles.’

**20.4.2 Assessment of 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 20.5.

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 20.5.

	Potential Risk	Possible cause	Requirement for further assessment?
<b>Potential vulnerability to disaster risks</b>			
	Flooding of site	Extreme weather- periods of heavy rainfall, taking into account climate change, strong winds and tidal events	No. While the site borders the River Liffey, flood risk to the site is low and existing ground levels are above the maximum 1% AEP fluvial water level and the 0.5% AEP tidal level. The risk of groundwater and pluvial flooding is also low. The minimum site flood defence level of the proposed development

	Potential Risk	Possible cause	Requirement for further assessment?
			<p>including an allowance for climate change and freeboard is 4.12mOD. Flood risk to the buildings on site will be managed by raising ground levels to between 5.0mOD and 5.2mOD. Access and egress routes will not be compromised during a flood event and the proposed development will also not impact on floodplain storage or conveyance.</p> <p>Refer to findings of the Flood Risk Assessment of the proposed development, <b>Appendix 14.1</b>.</p>
	<p>Incident at nearby SEVESO site resulting in off-site environmental impact</p>	<p>Fire/Explosion; and Equipment /Infrastructure failure</p>	<p>No. A “consultation distance” is very broadly defined under Regulation 2 of the COMAH Regulations as “a distance or area relating to an establishment, within which there are potentially significant consequences for human health or the environment from a major accident at the establishment. The consultation distance for some types of COMAH facility ranges from 300m for establishments where the risk is from flammable non-pressurised materials, to 1 km for establishments where chemical processing involving flammable or toxic substances takes place, to 2km for establishments with bulk storage of pressurised or toxic substances, triggering an obligation on the Planning Authority to notify the HSA.</p> <p>There are no COMAH sites within 2km of the proposed development site.</p>
	<p>Incident at nearby Heuston Station- such as explosion from terrorist attack</p>	<p>Fire/explosion Act of terrorism</p>	<p>Yes.</p>
<p><b>Potential to cause accidents and / or disasters.</b></p>			
	<p>Fire/Explosion</p>	<p>Equipment or infrastructure failure; Act of terrorism; Electrical problems</p>	<p>No. 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.</p>
	<p>Collision of Aircraft</p>	<p>Failure of air traffic control systems Act of terrorism</p>	<p>Yes</p>
	<p>Public safety along River Walk or in the open space (permitted under ABP-306569-20).</p>	<p>Crime Public negligence</p>	<p>No. Individual accidents/incidents are not considered to constitute a ‘major accident/disaster’ for the purposes of this assessment</p>

	Potential Risk	Possible cause	Requirement for further assessment?
	Vehicle collisions on site	Public negligence; and Failure of vehicular operations.	No. The facilitation of private vehicle use on site will be minimal and those limited number of vehicles that will access the site will be doing so to park, and thus travelling at low speeds. Further, individual accidents/incidents are not considered to constitute a 'major accident/disaster' for the purposes of this assessment.

Table 20.5 Risk Register- Operation

The potential operational phase risks identified for further assessment include: K 'Incident at nearby Heuston Station' and M 'Collision of Aircraft'.

These risks have been assessed in accordance with the relevant classification (Refer to Table 20.1 and Table 20.2) and the resulting risk analysis is given in Table 20.6.

The risk register is based upon possible risks associated the proposed development.

As outlined in Section **Error! Reference source not found.**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.

Risk ID	Potential Risk	Possible cause	Environmental effect	Likelihood Rating	Consequence Rating	Risk Score (Consequence x Likelihood)
<b>Construction phase</b>						
C	Quay wall/upper quay wall collapse (i.e. river wall)	Excavation/piling associated with the construction phase of the proposed development	<ul style="list-style-type: none"> <li>Injury</li> <li>Sedimentation of the River Liffey</li> </ul>	2	2	4
<p><b>Basis of Likelihood:</b> Standard best practice construction measures will be implemented by the contractor during construction. Temporary works will be provided to ensure the stability of the river wall in the early stages of construction, with permanent lateral restraints provided to the existing stonework along the River Liffey, whereupon the temporary retention structure will be removed, thus minimising the risk of collapse. The risk of the quay wall collapsing during construction is therefore considered ‘very unlikely’ in that it has ‘little opportunity or means to occur.’</p> <p><b>Basis of Consequence:</b> In the event of the collapse of the quay wall, a ‘limited’ consequence is expected in that a ‘limited number of people would be affected, with localised displacement of a small number of people for 6-24 hours, simple contamination, localised effects of short duration, and normal community functioning with some inconvenience’.</p>						
G	Falling debris from construction vehicles/cranes or cranes striking Luas overhead cables or poles	<ul style="list-style-type: none"> <li>Employee negligence or error</li> <li>Vehicle/crane failure</li> </ul>	<ul style="list-style-type: none"> <li>Injury/loss of life</li> </ul>	1	3	3
<p><b>Basis of Likelihood:</b> Transport Infrastructure Ireland (TII) (formerly the Railway Procurement Agency) suspend a ‘cradle’ supporting overhead line equipment over the Sean Heuston Bridge, which involves four poles and diagonal suspension wires at NW, NE, SW and SE corners of the bridge. TII has highlighted the potential for objects suspended from the crane used in the construction phase of the proposed development to come into contact with the overhead line equipment or poles. The potential for falling debris or objects from the crane during</p>						

Risk ID	Potential Risk	Possible cause	Environmental effect	Likelihood Rating	Consequence Rating	Risk Score (Consequence x Likelihood)
<p>construction has also been considered. However, standard best practice construction measures will be implemented by the contractor during construction. All crane operators will be fully trained, and all works will be undertaken in accordance with the 'Code of Practice for Working On, Near or Adjacent to the Luas Tram System<sup>14</sup>.' An 'extremely unlikely' likelihood of this risk is therefore identified in that it may 'only occur in exceptional circumstances'</p> <p><b>Basis of Consequence:</b> In the event of falling debris or objects from a crane, or indeed the crane coming into contact with the overhead cables or poles resulting in their felling, a 'serious' consequence would be likely, in that a 'significant number of people' could be affected, with 'multiple or serious injuries.'</p>						
Operational Phase						
K	Incident at nearby Heuston Station	<ul style="list-style-type: none"> <li>• Fire/explosion</li> <li>• Act of terrorism</li> </ul>	<ul style="list-style-type: none"> <li>• Illness, injury or death</li> <li>• Degradation of aquatic habitat and species</li> <li>• Air quality effects</li> </ul>	2	4	8
<p><b>Basis of Likelihood:</b> Whilst the <i>National Risk Assessment 2019</i><sup>7</sup> has identified the risk to Ireland from both domestic and international terrorism, such an incident is considered 'very unlikely' in that there are no similar 'recorded incidents or anecdotal evidence' of an attack of this magnitude in Ireland.</p> <p><b>Basis of Consequence:</b> Such an attack in Ireland could have significant impact in terms of public safety and security in the short term. Likewise, a breakdown in international peace and security arising from inter-state wars or other armed conflicts could have significant repercussions for Ireland and the EU, including potential impacts on energy supplies, transport routes or the environment. Thus, a 'very serious' consequence is identified in that such an event would result in numerous injuries and possibly fatalities, and there would be 'localised effects for an extended duration.'</p>						
M	Collision of Aircraft	<ul style="list-style-type: none"> <li>• Failure of air traffic control systems</li> <li>• Act of terrorism</li> </ul>	<ul style="list-style-type: none"> <li>• Injury or loss of life</li> </ul>	1	5	5

<sup>14</sup> Transport Infrastructure Ireland (2016) *Code of Practice for Working On, Near or Adjacent to the Luas Tram System*, Dublin, Ireland.

Risk ID	Potential Risk	Possible cause	Environmental effect	Likelihood Rating	Consequence Rating	Risk Score (Consequence x Likelihood)
<p><b>Basis of Likelihood:</b> The collision of aircraft with the 30-storey residential building is considered an ‘extremely unlikely risk’ in that it may only occur in exceptional circumstances. Consultation with the Aviation Authority has taken place and will continue prior to construction and operation of the proposed development. In consideration of a collision resulting from a potential act of terrorism, again an ‘extremely unlikely’ risk is identified.</p> <p><b>Basis of Consequence:</b> Should the collision of an aircraft with the proposed development occur, a ‘catastrophic’ consequence is predicted, in that a ‘large numbers of people’ would be impacted with ‘significant numbers of fatalities (&gt;50)’.</p>						

**Table 20.6** Risk Assessment

This risk assessment in Table 20.7 categorises each of the potential risks by their ‘risk score’. A corresponding risk matrix is provided in Table 20.8 which is colour coded in order to provide an indication of the critical nature of each risk. As outlined in Section 20.2.7.2, the red zone represents ‘high risk scenarios’, the amber zone represents ‘medium risk scenarios’ and the green zone represents ‘low risk scenarios.’

Risk ID	Potential Risk	Likelihood Rating	Consequence Rating	Risk Score
<b>Construction Phase</b>				
C	Quay wall/upper quay wall collapse (i.e. river wall)	2	2	4
G	Falling debris from construction vehicles/cranes or cranes striking luas overhead cables or poles	1	3	3
<b>Operational Phase</b>				
K	Incident at nearby Heuston Station	2	4	8
M	Collision of aircraft	1	5	5

Table 20.7 Risk Scores

<b>Likelihood Rating</b>	<b>Very likely</b>	<b>5</b>					
	<b>Likely</b>	<b>4</b>					
	<b>Unlikely</b>	<b>3</b>					
	<b>Very unlikely</b>	<b>2</b>		C		K	
	<b>Extremely Unlikely</b>	<b>1</b>			G		M
			<b>Minor</b>	<b>Limited</b>	<b>Serious</b>	<b>Very Serious</b>	<b>Catastrophic</b>
			<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Consequence Rating</b>							

Table 20.8 Risk Matrix

## 20.5 Likely Significant Effects

### 20.5.1 Do-Nothing Scenario

It is not practicable to complete the consented scheme (ABP-306569-20, Blocks B & C) without a further grant of permission for development that resolves the eastern elevation of Block B2, at the site of proposed Block A.

As such, in the event that the proposed development does not proceed, the land-use of the proposed development site, and number of people utilising the site would remain as it is currently. In the absence of an increased number of people residing, working or visiting the site, and in the absence of the proposed change in use of the site, there would be no increase in the risk of major accidents occurring due to human interaction, should a disaster take place.

Under the 'Do-Nothing' Scenario, as described above, the quay wall, as well as the existing buildings on the site of the proposed development (and the associated consented development) will not undergo any remediation works and will continue to deteriorate at their current rate. The risk of building and/or quay wall collapse, and the associated risk of a major accident occurring will therefore increase under the 'Do-Nothing' Scenario.

### 20.5.2 Construction Phase Risks

From examining the plausible risks presented in Table 20.6, 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 'quay wall/upper quay wall collapse.'

The risk of quay wall/upper quay wall collapse 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 20.8, this is indicative of a 'low risk scenario.'. Temporary design measures such as lateral steel restraints will be provided to the existing stone wall along the river during construction, until the permanent lateral restraints are installed.

### 20.5.3 Operational Phase Risks

From examining the plausible risks presented in Table 20.7, 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 an 'incident at nearby Heuston Station.'

The risk of an incident at Heuston Station was given a risk score of 8 indicating a scenario that is 'very unlikely' to occur, but which would have 'very serious' consequences should it do so. According to the risk matrix provided in Table 20.8, this is indicative of a 'medium risk scenario.'

The *Global Terrorism Index (GTI)*<sup>15</sup> is a comprehensive study analysing the impact of terrorism for 163 countries and which covers 99.7 per cent of the world's population. In 2020, Ireland had a 'Global Terrorism Index Score' of 2.845<sup>16</sup>, and ranked as the 62<sup>nd</sup> country most impacted by terrorism of the 163 countries.

Whilst the *National Risk Assessment 2019*<sup>7</sup> has identified the risk to Ireland from both domestic and international terrorism, there are no similar 'recorded incidents or anecdotal evidence' of an attack of this magnitude in Ireland.

#### 20.5.3.1 Mitigation During Operation

As there are no significant effects on air quality predicted during the operational phase of the proposed development, no mitigation measures are proposed.

### 20.5.4 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 20.5.2 and 20.5.3, no likely risks of a major accident/disaster occurring are identified in respect of the proposed development. Thus, no indirect effects are identified.

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<sup>15</sup> Institute for Economics and Peace (2020) Global Terrorism Index 2020

<sup>16</sup> The four factors counted in each country's yearly score are: total number of terrorist incidents in a given year, total number of fatalities caused by terrorists in a given year, total number of injuries caused by terrorists in a given year, a measure of the total property damage from terrorist incidents in a given year

### **20.5.5 Cumulative Effects**

As outlined in Section 20.5.2 and 20.5.3, no likely risks of a major accident/disaster occurring are identified in respect of the proposed development. Thus, no cumulative effects are identified.

## **20.6 Mitigation and Monitoring**

### **20.6.1 Construction Phase**

As previously discussed, temporary design measures such as lateral steel restraints will be provided to the existing stone wall along the river during construction, until such time as permanent restraints are installed.

The construction phase of the proposed development will also be carried out in accordance with best practise construction measures outlined in the Construction Environmental Management Plan (CEMP) which is included in **Appendix 4.1**.

Refer to **Chapter 4**, Construction Strategy for further information.

No monitoring is proposed specific to reducing the risk of major accidents/disasters during construction.

### **20.6.2 Operational Phase**

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

## **20.7 Residual Effects**

The risk of a major accident and/or disaster during the construction phase of the proposed development is considered low.

The risk of a major accident and/or disaster occurring during the operational phase of the proposed development is considered medium.

## **20.8 Difficulties Encountered**

No difficulties were encountered in the compilation of this chapter.