Alexandra Basin Redevelopment 2

Bringing Dublin Port To 2040

Environmental Impact Assessment Report

Chapter 6 Risk of Major Accidents & Disasters

Volume 2



CALAFORT ÁTHA CLIATH
DUBLIN PORT

TETRA TECH

6 Risk of Major Accidents & Disasters

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6.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) describes the assessment undertaken of the potential risks of major accidents and disasters relevant to the ABR2 Project. The ABR2 Project is within the vicinity of several establishments that fall within the scope of the Chemicals Act (Control of Major Accident Hazards) Regulations 2015 (S.I. 209/2015) ("COMAH Regulations") within Dublin Port, and the Project lies within the Consultation Distance of three COMAH establishments, namely Calor Teoranta, Circle K Energy Holding Limited, and Indaver Ireland Limited. This chapter of the EIAR describes the individual and societal risks to the Project arising from potential major accidents at establishments covered by the COMAH Regulations, the risks associated with other events (natural and other external events) that could contribute to, cause, or exacerbate a major accident or that could directly impact on the ABR2 Project, and the potential for a major accident at the ABR2 Project to impact on the adjacent parts of Dublin Port and the COMAH establishments.

In light of the nature of the activities that will take place at the ABR2 Project site, and the nature of the surrounding environment, the most significant risks of major accidents and disasters are associated with the COMAH establishments.

Byrne Ó Cléirigh conducted a COMAH land use planning assessment for the ABR2 Project, the purpose of which was to examine the development in the context of the Health and Safety Authority's COMAH land use planning guidance, and to identify the types of development that may be compatible with the COMAH risk zones around the COMAH (and similar) establishments. Byrne Ó Cléirigh's analysis was guided by an assessment of the likelihood of the occurrence of each perceived risk, supported by general and systemic risk assessments. The COMAH land use planning assessment report is included in **Appendix 6-1** of the EIAR.

6.2 Study Area

The ABR2 Project lies within Dublin Port on the north side of the River Liffey, with the main areas encompassing Alexandra Basin West and the basin of Berths 52/53, described in **Chapter 5 Project Description**.

There are six COMAH establishments in Dublin Port on the north side of the River Liffey (five upper tier and one lower tier establishment), and three COMAH establishments on the south side of the river (two upper tier and one lower tier). The closest COMAH establishments to the ABR2 Project are the Circle K establishment to the north / northeast of Alexandra Basin West, approximately 250m at the closest point. The closest COMAH establishments to the basin of Berths 52/53 are Calor, Indaver, Circle K and Valero, approximately 600m to 760m at the closest points. The COMAH establishments on the south side of the river are approximately 600m to 800m from the ABR2 Project at the closest points. The northernmost part of the Dublin Bay Power lower tier establishment, on the south side of the river, lies marginally inside the ABR2 Study Area (see **Figure 6-1**).

To account for the presence of the COMAH establishments on both the north and south sides of the river, all of the establishments are included in within the study area for the assessment of major accidents, both those

that could impact on the ABR2 Project and, potentially, the accidents at the ABR2 Project that could impact on the COMAH establishments.

In addition to the COMAH establishments, the other activities within the Port on the north side of the river are included within the study area, namely the presence of the common oil pipeline serving the oil terminals, the road network conveying goods into and out of the Port, and the marine traffic that conveys goods (including dangerous goods) into and out of the Port.

The Major Accidents & Disasters Study Area is shown in **Figure 6-1**, showing the location of the upper tier COMAH establishments (dotted red line), and the lower tier COMAH establishments (dotted blue line).

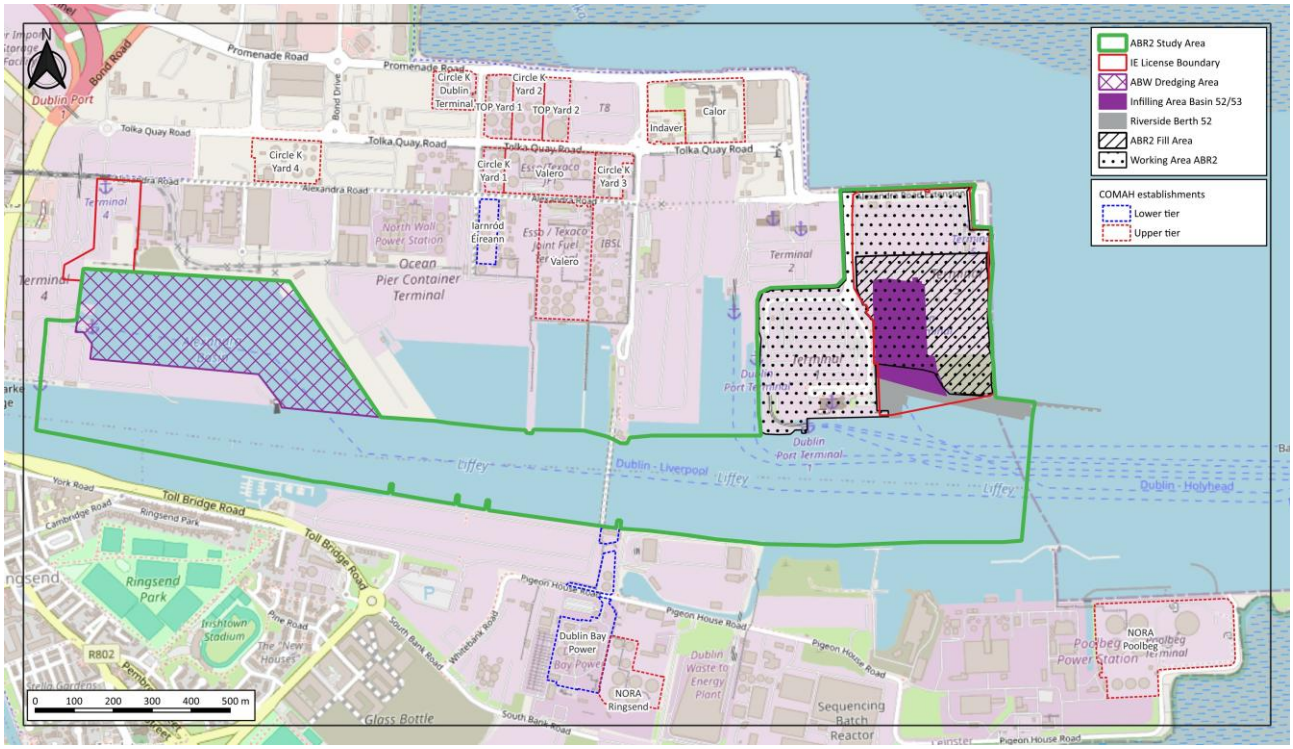


Figure 6-1: Major Accidents and Disasters Study Area

6.3 Data Sources

The following data sources were used in assessing the potential major accidents and disasters:

- Health and Safety Authority (HSA) list of notified upper and lower tier COMAH establishments.
- Information on COMAH establishments from the Public Information data on the HSA website.
- Dublin Port Company drawing showing the location and route of the common oil pipeline.
- Dublin Port Company traffic survey data for road traffic within the Port.
- Dublin Port Company vessel arrival and departure data for marine traffic within the Port (for 2025).
- Dublin Port trade statistics
- National Transport Authority and Dublin City Council traffic count data and surveys

- Transport Infrastructure Ireland traffic data
- Central Statistics Office data on populations in, and in the vicinity of the Port.
- School of Cosmic Physics National Seismic Network (INSN) data on seismic events in Ireland.
- UK Met Office lightning location network data (ATDnet) for lightning activity across Europe.
- Office of Public Works (OPW) National Flood Hazard Mapping system.
- Met Éireann meteorological data for the Dublin Airport and Phoenix Park meteorological stations.
- Department of Transport and the Department of the Environment, Heritage and Local Government Public Safety Zones (PSZ) associated with Dublin Airport.

6.4 Context

6.4.1 Guidelines for Environmental Impact Assessment

6.4.1.1 European Commission

Section 1.3.3 of the European Commission's *Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report* (2017) sets out the requirements for the identification and assessment of accident and disaster risks (major accidents and disasters). It identifies the two key considerations arising from Annex IV of Directive 2014/52/EU, namely:

- the project's potential to cause accidents and / or disasters
- the vulnerability of the project to potential disaster / accident

The guidance notes that the requirements apply to both natural (e.g. earthquakes) and man-made disasters (e.g. technological hazards) that could significantly impede the project's activities and objectives and which might have adverse effects. It also notes that relevant information on these topics may be available from risk assessments pursuant to other EU legislation, such as the COMAH legislation on the control of major accident hazards involving dangerous substances. The factors that should be considered in the assessment of major accidents and disasters include:

- What can go wrong with a project?
- What adverse consequences might occur to human health and to the environment?
- What is the range of magnitude of adverse consequences?
- 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?

This Chapter of the EIAR considers each of these factors in the context of natural disasters and man-made disasters primarily associated with the COMAH establishments and other hazardous activities within the Port.

Other Chapters of the EIAR consider specific hazards and potential adverse impacts on the Project, for example flooding in **Chapter 9 Water Quality and Flood Risk Assessment**, climate change in **Chapter 11 Climate**, and cultural heritage in **Chapter 17 Cultural Heritage**.

6.4.1.2 Department of Housing, Planning and Local Government

Section 1.6 of the Department of Housing, Planning and Local Government's *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment* (August 2018) summarises the direct and indirect significant effects of a project that must be identified, described and assessed, including expected significant effects arising from the vulnerability of the project to the risks of relevant major accidents and disasters. Sections 4.28 to 4.30 of the guidelines set out in more detail the requirements for identifying and assessing the risks of major accidents and disasters:

> "The EIA must include the expected effects arising from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project. Where appropriate, the description of expected significant effects should include details of the preparedness for and proposed response to such emergencies."

The guidelines note that there are two key considerations, namely:

- The potential of the project to cause accidents and / or disasters, including implications for human health, cultural heritage, and the environment.
- The vulnerability of the project to potential disasters / accidents, including the risk to the project of both natural disasters (e.g. flooding) and man-made disasters (e.g. technological disasters).

The guidelines also note that these considerations are separate to any assessment of the project required under the COMAH Directive (and corresponding Irish legislation), which is likely to include a detailed risk assessment. This Chapter of the EIAR includes an assessment of the risks of major accidents and disasters relevant to the project, taking into account the two key considerations of the Department's guidelines.

6.4.1.3 Environmental Protection Agency

Section 3.7.1 of the Environmental Protection Agency's (EPA) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (May 2022) describes the requirements for the impact assessment, noting that the EIAR should contain:

> "A description of the likely significant effects of the project on the environment resulting from, inter alia:
>
> d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);
>
> The description of the likely significant effects on the [environmental] factors should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project."

This Chapter of the EIAR assesses the risks to human health and the environment, where relevant to the Project, due to major accidents and disasters. Other Chapters of the EIAR consider specific hazards and

potential adverse impacts on the Project, for example flooding in **Chapter 9 Water Quality and Flood Risk Assessment**, climate change in **Chapter 11 Climate**, and cultural heritage in **Chapter 17 Cultural Heritage**.

6.4.1.4 Office of the Planning Regulator

The Office of the Planning Regulator's (OPR) *OPR Practice Note PN02 Environmental Impact Assessment Screening* provides information and guidance on screening for Environmental Impact Assessment (EIA) by planning authorities. While it is not intended to provide guidance on EIA itself, it identifies the criteria to be considered at the screening stage, and therefore the criteria to be included in the EIAR itself.

6.4.2 COMAH Regulations

6.4.2.1 Overview

The COMAH Regulations have been made under the Chemicals Acts 2008 and 2010 to transpose Directive 2012/18/EU on the control of major accident hazards involving dangerous substances into Irish law. Directive 2012/18/EU superseded previous Council Directive 96/82/EC ("the SEVESO III Directive"). The purpose of the COMAH Regulations is to lay down rules for the prevention of major accidents involving dangerous substances, and to seek to limit as far as possible the consequences for human health and the environment of such accidents when they occur, with the overall objective of providing a high level of protection in a consistent and effective manner.

The COMAH Regulations place an obligation on operators of establishments that store, handle, or process dangerous substances above certain thresholds to take all necessary measures to prevent major accidents and to limit the consequences for human health and the environment. Under the Regulations, an establishment may qualify as upper tier or lower tier, depending on the inventory of dangerous substances; sites that store, handle, or process dangerous substances below a certain threshold do not qualify as establishments under the Regulations.

The types of dangerous substance that contribute to an establishment's inventory include flammable substances (such as liquefied petroleum gas, gasoline/petrol, kerosene, and certain solvents), toxic substances, and substances that are hazardous to the aquatic environment. The types of establishment that may fall within the scope of the Regulations (depending on their inventories) include oil storage and distribution sites, LPG storage and distribution sites, pharmaceutical plants, and sites that manufacture and/or store certain types of fertiliser.

To assist the competent authorities in their consideration of the application for development consent in respect of the proposed development, a COMAH land use planning assessment of the development has been prepared in accordance with the HSA's "Guidance on technical land-use planning advice" (2023) and is described in this chapter of the EIAR.

6.4.2.2 Establishments

The COMAH establishments within the Port are listed in **Table 6-1**. Most of these establishments store petroleum products (seven of the nine establishments). Of the remaining two, one stores and distributes LPG (Calor), and the other (Indaver) operates a hazardous waste facility.

Table 6-1: COMAH establishments in vicinity of proposed development

Establishment	Location	Tier	Activity	Consultation Distance
Calor Teoranta	Tolka Quay Road, Dublin 1	Upper	LPG storage & distribution	600m
Circle K Ireland Holding Ltd	Promenade Road, Dublin Port, Dublin 3	Upper	Oil storage & distribution	400m & 300m
Indaver Ireland Ltd.	Tolka Quay Road, Dublin Port, Dublin 1	Upper	Hazardous waste	700m
Tedcastles Oil Products	Promenade Road, Parish of St. Thomas, Dublin Port, Dublin 1	Upper	Oil storage & distribution	400m
Valero Energy Ireland Ltd.	Alexandra Road, Dublin Port, Dublin 1	Upper	Oil storage & distribution	400m
Iarnród Éireann	Alexandra Road, North Wall, Dublin 1	Lower	Oil storage	300m
Synergen Power Ltd t/a ESB Dublin Bay Power	Pigeon House Road, Ringsend, Dublin 4	Lower	Oil storage (power generation)	300m
The National Oil Reserves Agency (NORA)	Shellybanks Road, Ringsend Dublin 4	Upper	Oil storage	300m
The National Oil Reserves Agency	Pigeon House Road, Ringsend, Dublin 4	Upper	Oil storage	300m

The ABR2 Project lies within the consultation distances for the Calor, Circle K and Indaver establishments. The closest COMAH establishment to the proposed development is the western-most part of the Circle K Ireland Holding Ltd. establishment (Yard 4), which forms part of the overall upper tier establishment.

6.4.2.2.1 Calor Teoranta

The Calor establishment comprises seventeen aboveground and four semi-mounded LPG tanks, together with a road tanker loading facility from which LPG is distributed to domestic, commercial and industrial consumers via road tanker, and a set down area for LNG ISO containers for distribution. The LPG storage vessels are located towards the centre and west / northwest of the site, and the LNG ISO container set down area is to the northwest. Of the twenty-one LPG tanks, seventeen are aboveground tanks (two of which are not in service), and the remaining four tanks are located to the northwest and are semi-mounded. The road tanker loading area is located to the east of the site.

6.4.2.2.2 Circle K Ireland Holding Limited

The Circle K establishment comprises four storage yards (Yards 1 to 4) for petroleum and renewable energy products and the Terminal for the loading of petroleum and renewable energy products into road tankers. The closest part of the establishment to the ABR2 Project is Yard 4 to the west of the Port on Alexandra Road. This yard contains three bunded storage areas and ten bulk storage tanks storing a combination of class I petroleum

(gasoline), class II petroleum (kerosene), and class III petroleum (diesel). There is a road loading gantry for loading class II petroleum, with the class I and class III petroleum transferred to the main road loading Terminal on Number 2 Branch Road North Extension via the common oil pipeline.

6.4.2.2.3 Indaver Ireland Limited

Indaver operates a hazardous waste facility for blending and transhipment of solvent wastes, and for receipt, storage and transfer of packaged wastes to other waste facilities in Ireland and abroad for disposal / recovery / recycling. The facility is located to the north of Tolka Quay Road at the junction with Breakwater Road North, and to the west of the Calor establishment. The facility comprises a solvent blending tank farm to the northeast of the site containing three solvent tanks, and several warehouses for the storage of packaged wastes to the west of the site.

6.4.2.2.4 Tedcastles Oil Products

The Tedcastles Oil Products (TOP) establishment comprises two parts: Yard 1 comprising two bunded storage areas containing nine bulk storage tanks, a separate 'cup-tank', and the road loading gantry, and Yard 2 comprising a single bunded area with seven bulk storage tanks. The establishment stores a variety of petroleum and renewable energy products, including class I (gasoline), class II (kerosene), and class III (diesel / gas oil) products. The two yards are located on Tolka Quay Road, with the Circle K Yard 2 lying between TOP Yard 1 and TOP Yard 2.

6.4.2.2.5 Valero Energy Ireland Ltd.

The Valero Energy establishment comprises two parts: the northern part to the north of Alexandra Road comprising six bunded areas containing eleven bulk storage tanks for petroleum and renewable energy products, and the south part to the south of Alexandra Road comprising a single bunded area with seven bulk storage tanks as well as the road loading gantry. The establishment stores a variety of petroleum and renewable energy products, including class I (gasoline) and class II (kerosene) products in the northern part of the site, and class III (diesel / gas oil) products in the southern part of the site.

6.4.2.2.6 Iarnród Éireann

The Iarnród Éireann establishment is on Alexandra Road at the junction with Number 4 Branch Road South and comprises a single bund with two bulk storage tanks for class III petroleum products (diesel) along with a road loading facility for supplying other Iarnród Éireann facilities with diesel.

6.4.2.2.7 Synergen Power Ltd t/a ESB Dublin Bay Power

Synergen Power Ltd. (Dublin Bay Power) stores class III petroleum (gas oil) as a back-up fuel for the natural gas fired power plant. Dublin Bay Power is supplied by a natural gas pipeline via an above ground installation (AGI) at the southeast corner of the site.

6.4.2.2.8 The National Oil Reserves Agency (NORA) – Ringsend

The NORA Ringsend Tank Farm comprises nine above ground oil storage tanks, along with a ship pipeline connection and a truck loading facility. The tank farm is divided into two bunded areas: the northern bund contains four tanks; the southern bund contains the remaining five tanks. A ship pipeline connects the facility to the quayside north of the site. The truck loading area is located in the south-east of the site. The site stores diesel, a class III petroleum product.

6.4.2.2.9 The National Oil Reserves Agency (NORA) – Poolbeg

NORA's Poolbeg facility comprises seven above ground oil storage tanks and two marker dye tanks. There are seven diesel (class III petroleum product) tanks, one of which serves the ESB Poolbeg generating station, and one kerosene tank (class II petroleum product). The Poolbeg tank farm is served by the existing jetty at the neighbouring ESB station and also road loading facilities.

6.4.2.2.10 Summary of Storage Areas & Substances

Table 6-2 summarises the nine COMAH establishments, showing the main parts of the establishments, the storage / bunded areas, the total number of bulk tanks / storage vessels, and the COMAH substances stored or present in bulk quantities. The establishments and bunds are shown in **Appendix 6-2**.

Table 6-2: Summary of establishments, storage areas & bulk COMAH substances

Establishment	Yard / Part of Site	Bunded Area	No. of tanks (total)	COMAH Substances
Calor	-	-	19	LPG
	-	-	20	LNG
Circle K	Yard 1	Bund 1 (north)	5	Class III petroleum
		Bund 2 (south)	4	Class III petroleum
	Yard 2	Bund 1	7	Class I petroleum Class III petroleum Ethanol
	Yard 3	Bund 1	2	Class III petroleum
	Yard 4	Bund 1 (south)	2	Class II petroleum
		Bund 2 (east)	4	Class II petroleum
		Bund 3 (west)	4	Class I petroleum Class II petroleum Class III petroleum
Indaver	-	Bund 1 (north)	2	Solvent
		Bund 2 (south)	1	Solvent
		Drumstore	-	Wastes
Tedcastles Oil Products	Yard 1	Bund 1 (south)	3	Class I petroleum
		Bund 2 (north)	6	Class II petroleum Class III petroleum
		Cup tank	1	Class II petroleum
	Yard 2	Bund 1	6	Class I petroleum Class III petroleum
Valero Energy Ireland	North Yard	Bund 1 (west)	2	Class II petroleum
		Bund 2	2	Class I petroleum Class II petroleum
		Bund 3	2	Ethanol
		Bund 4	3	Class I petroleum

Establishment	Yard / Part of Site	Bunded Area	No. of tanks (total)	COMAH Substances
				Class II petroleum
		Bund 5 (east)	2	Class II petroleum
	South Yard	Bund 1	7	Class III petroleum
Iarnród Éireann	-	Bund 1	2	Class III petroleum
Synergen Power Limited	-	Bund 1	2	Class III petroleum
NORA – Ringsend	-	Bund 1 (north)	4	Class III petroleum
		Bund 2 (south)	5	Class III petroleum
NORA – Poolbeg	-	Bund 1 (west)	4	Class III petroleum
		Bund 2 (east)	1	Class II petroleum
		Bund 3 (south)	3	Class III petroleum

6.4.2.3 Generating Stations

In addition to the ESB Dublin Bay Power generating station on the south side of the river, which falls within the scope of the COMAH Regulations by virtue of the quantity of diesel stored as a backup fuel, there are four other generating stations relevant to this assessment:

- The ESB Northwall generating station on the northside of the river, which formerly fell within the scope of the COMAH Regulations by virtue of the quantity of diesel stored as a backup fuel. This generating station was originally designed as an oil-fired station but has been converted to fire on natural gas and is supplied by natural gas via an AGI.
- The ESB Poolbeg OCGT (open-cycle gas turbine) generating station located to the west of NORA Poolbeg, supplied by natural gas via an AGI.
- The Poolbeg FlexGen station is located to the south of the ESB Poolbeg OCGT and to the southwest of the NORA Poolbeg establishment. It comprises an aero derivative gas fired turbine and is designed to complement renewable energy on the grid, with the capability to ramp up and down quickly as demand varies. The Poolbeg FlexGen is supplied with natural gas via an AGI.
- The Dublin Bay Power / Ringsend FlexGen is similar to the Poolbeg FlexGen station, comprising an aero derivative gas fired turbine designed to complement renewable energy on the grid, with the capability to ramp up and down quickly as demand varies. It is located to the south of the Dublin Bay Power generating station and to the south / southwest of the NORA Ringsend establishment. It is supplied with natural gas via an AGI.

These four generating stations / units do not qualify as establishments under the COMAH Regulations; however, as they include AGI and natural gas pipelines, the gas infrastructure (pipelines) downstream from the AGI has been included in this assessment in line with the HSA's guidance on natural gas pipelines[1].

6.4.2.4 Land Use Planning

The EU's guidelines on Land Use Planning[2] (LUP) describe the ideal LUP technical advice system:

> "In principle all risk assessment methods without regard to individual applications have the same relevant elements; these are:
>
> - definition of scope, objectives and risk criteria,
> - description of the object or area of concern,
> - identification of hazards,
> - identification of vulnerable targets,
> - assumption of source terms or hazardous incidents,
> - development of escalation scenarios,
> - estimation of consequences,
> - estimation of likelihood,
> - presentation of resulting risk and comparison with established tolerability criteria,
> - identification of mitigation measures, and
> - acceptance of result, modification or abandoning.

Besides these elements a proper risk assessment should furthermore ensure:

- a level of detail proportional to the severity of consequences,
- the use of acknowledged methods (or it must be demonstrated that these are equivalent),
- reliability of data and relevant information, and
- transparency of the process."

The HSA has set out its policy and approach to conducting land use planning assessments in its *Guidance on technical land-use planning advice* (version 2, 2023). In March 2026, the HSA published a proposed revision to its guidance on land use planning for public consultation, with the consultation closing on 15th April 2026. The proposed revision to the guidance includes changes to how the HSA proposes to assess the risks

[1] Section 3.5.1 of the HSA's guidance sets out the scenarios to assess for natural gas pipelines within an establishment. While four of the five generating stations / units within the area of the Port do not qualify as COMAH establishments, it is prudent to assess the natural gas pipelines – nominally high-hazard infrastructure – using the same approach as applied to the Synergen Power establishment, which is a COMAH establishment with natural gas infrastructure.
[2] Land use Planning Guidelines in the Context of Directives 96/82/EC and 105/2003/EC

associated with certain types of major accident hazard relevant to COMAH land use planning. As the HSA's proposed revisions to its guidance have not yet been formally adopted, this assessment of the risks associated with the COMAH establishments has taken into account only the HSA's current guidance (2023).

6.4.3 An Comisiún Pleanála

In December 2011, the HSA and what was then An Bord Pleanála (ABP) signed a Memorandum of Understanding (MOU) to facilitate the co-operation between the two bodies in the processing of applications for planning permission under planning legislation, and in particular direct applications to ABP under the Planning and Development (Strategic Infrastructure) Act 2006 (the SIA[3]).

The MOU noted that the HSA is obliged to provide technical land use planning advice relating to developments that qualify as COMAH establishments or relating to developments in the vicinity of COMAH establishments, and that this advice must be provided to ACP on request and within prescribed timeframes. It also recognised that assessments by the HSA of planning applications from COMAH establishments, or of developments in the vicinity of COMAH establishments, can take a considerable amount of time and therefore sufficient lead time should be afforded to the HSA to formulate its technical advice to ACP.

In this context, ACP undertook to ensure that details of any proposed planning applications under the SIA, and on which ACP may seek technical advice from the HSA, are made available to the HSA at the earliest opportunity. In addition, ACP noted that it will request that such details are provided to the HSA at the pre-application consultation stage by the (prospective) applicant.

6.4.4 Dublin City Development Plan

In December 2022, the Dublin City Development Plan 2022-2028 came into effect. Chapter 9.5.10 of the development plan sets out Dublin City Council's policy on the development of COMAH establishments and developments in the vicinity of COMAH establishments, namely:

> "It is the Policy of Dublin City Council:
>
> SI44: COMAH Establishments/SEVESO
>
> To have regard to the provisions of the SEVESO III Directive (2012/18/EU) relating to the control of major accident hazards involving dangerous substances and its objectives to prevent major accidents and limit the consequences of such accidents. Dublin City Council will have regard to the provisions of the Directive and recommendations of the HSA in the assessment of all planning applications located on, or impacted by, COMAH establishments in accordance with Guidance on Technical Land-use Planning Advice: for planning authorities and operators of COMAH establishments (2021)."

[3] Subsequently amended by the Planning and Development (Amendment) Act 2010

As noted in **Section 6.4.2.4**, the latest version of the HSA's guidance on COMAH land use planning is version 2 published in 2023; at the time the development plan came into effect, the HSA's guidance was version 1 published in 2021.

6.5 Baseline Environment

6.5.1 Port Activities

The Port covers approximately 265hato the north and south of the River Liffey. The following activities and operations take place with the Port on the north and south sides of the river:

- load-on / load-off (Lo / Lo) terminals,
- roll-on / roll-off (Ro / Ro) terminals, for both freight and passenger traffic,
- storage facilities for petroleum products, LPG and molasses,
- common oil pipeline linking the oil berths with the petroleum, LPG and molasses storage facilities,
- dry bulk handling facilities for a wide variety of materials, including peat, grain, animal feedstuff, fertiliser, sand, coal, petroleum coke, slags, scrap metals and cement,
- warehouse space,
- vehicle storage facilities,
- cruise liner operations, and
- leisure craft mooring and movements at Poolbeg (south of the river) and Dublin City Marinas.

6.5.2 Populations

6.5.2.1 Summary

The population within Dublin Port comprises:

- workers at the respective industrial and commercial sites (at both the COMAH establishments and non-COMAH facilities);
- vehicle traffic using the Port road network, which includes:
  - workers commuting to and from their place of work within the Port, and
  - goods vehicle drivers that operate to / from the Port, including those associated with:
    - direct Port activities (e.g. delivering / collecting cargo, such as containers or trailers, shipped to / from the Port);
    - import / export related activities from facilities within the Port (e.g. fuel distribution from the oil / LPG facilities that import oil / LPG, car distributors that import vehicles for sale on the Irish market, waste facilities that collect / blend hazardous wastes for export); and

- non-Port related activities that are located within the Port estate.

- HGV and passenger vehicle traffic departing from / arriving at the Ro-Ro / ferry terminals, together with private and public transport serving the cruise liner traffic;
- other traffic that may access parts of the road network, for example the service station at the junction of Promenade Road and Bond Drive Extension;
- shipping traffic at the berths along the north and south quays;
- cruise liner passengers (and crew) arriving at / departing from the multi-purpose berths;
- passengers arriving / departing on the ferries operating from the ferry terminals; and
- HGV / goods traffic arriving / departing on the HGV / truck ferries.

There are also several residential areas in the vicinity of the Port:

- On the northside of the Port at Clontarf and East Wall, approximately 400m to 750m from the northern and western parts of the Port estate.
- On the southside of the Port there are several residential areas to the west and south-west, at Ringsend and Sandymount. These areas are approximately 550m to 650m from the nearest COMAH establishment.

To assess the societal risk presented by the COMAH establishments in the Port it is necessary to quantify the population that may be exposed to potential major accidents.

Estimating the number of people that may be exposed is relatively straightforward, as the number of people is known (e.g. from census data) and there is little or no temporal or spatial variation (the population is present at a fixed location for a discernible proportion of time). The residential populations to the north and west of the Port fall into this category, as do the populations at the commercial and industrial facilities to a lesser extent.

Other populations, however, are more difficult to characterise and quantify as they vary in terms of:

- the number of people present at any one time (e.g. the number of passengers on a ferry),
- the location of the people (e.g. people using the road network), and
- when people are present, which can vary over the course of a day, week and year (e.g. peak and off-peak traffic patterns, non-regular shipping & cruise berthing, and intermittent embarkation / disembarkation at the passenger ferry terminals).

Both the road traffic and, to a lesser extent, the ferry and shipping traffic, falls into this latter category, as these populations are both transient and mobile.

Nonetheless, for this assessment, the population data available from Dublin Port and the Central Statistics Office and has been used to estimate the number of people that may be exposed to potential major accident hazards at the COMAH establishments.

In the following sub-sections, the sources of the population data used in this assessment are described, the approach to characterising and quantifying the population is described, and the assessment of the conservative nature of the assumptions that have been applied are set out. The objective of this exercise is to develop a representative population for the Port and surrounding area, rather than to develop a detailed population and transport model. The population data used in this assessment is summarised in **Appendix 6-3.**

6.5.2.2 Residential Areas

The closest residential areas to the northern and western parts of the Port are:

- to the north, in Clontarf along Clontarf Road and the adjoining roads (approximately 625m to the north across the River Tolka Estuary). This area also includes:
  - residential buildings (houses and apartments),
  - a school (Holy Faith Secondary School),
  - a church (Church of St. John the Baptist),
  - a convent (Convent of the Holy Faith),
  - a presbytery (St. John the Baptist Presbytery),
  - Clontarf Yacht & Boat Club,
  - Clontarf Lawn Tennis Club, and
  - Dublin Bus garage.
- To the west, in East Wall to the west and south of East Wall Road (approximately 200m from the western boundary of the Port estate and 550 m from the nearest COMAH establishment).

The closest residential areas to the west and southwest parts of the southern port are:

- to the west, in Ringsend along Pigeon House Road and the adjoining roads (approximately 550m from the western boundary of Dublin Bay Power). This area includes:
  - residential buildings (houses and apartments)
  - Ringsend Recycling Centre
  - 1st Port of Dublin, Ringsend Sea Scouts
  - Ringsend College (a multi denominational secondary school and further education college)
  - Irishtown Sports and Fitness Centre
  - Clanna Gael Fontenoy GAA Club
  - Poolbeg West SDZ developments
- to the southwest, in Sandymount (approximately 650m from the southern boundary of Dublin Bay Power).

The latest population data from the CSO is from the 2022 census, with population data available at a variety of geographic levels (provinces, regional authorities, local authorities, electoral areas, electoral divisions, small areas, and Limistéir Pleanála Teanga (Language Planning Areas)).

For the residential population around the Port, data was used from the Small Areas; these are areas of population generally comprising between 80 and 120 dwellings and are designed as the lowest level[4] of geography for the compilation of statistics. The 2022 census did not include the prospective population for the proposed developments associated with the Poolbeg West SDZ for which planning permission has been applied for and/or granted, and therefore these populations have been included separately.

6.5.2.3 Commercial & Industrial

A single Small Area covers the northern part of the Port and a separate single Small Area covers the southern part of the Port, given that the Small Areas are intended to represent households rather than work areas. In 2016, the CSO published data on the 'day-time population' of areas, referred to as workplace zones. The day-time population includes everyone who indicated they worked or studied in the area, along with persons in that area who do not work or study (and are therefore there during the day). These zones were created by the CSO by amalgamating and / or splitting the Small Areas output from the census. While the 2016 workplace zones provided an indication of the population during daytime hours, they do not lend themselves to characterising the Port population to assess the societal risk as they cover too large an area. In addition, in the 2022 Census, the CSO collected / amalgamated data on Place of Work, School, College or Childcare (POWSCCAR) data. While this data is anonymised, it is not publicly available (under the General Data Protection Regulation, GDPR).

To characterise and estimate the industrial and commercial population in the Port (on the north and south sides) a combination of the following data has been used, which is considered to be appropriate to the nature of the societal risk assessment associated with the COMAH establishments:

- population survey data of the industrial and commercial facilities in the Port
- publicly available information on the industrial and commercial facilities in the Port, including planning documents
- estimates of populations based on the type and size of the industrial / commercial activities.

6.5.2.4 Road Traffic

Other than traffic associated with the construction works for the project, the ABR2 Project itself will not result in any material change to the traffic patterns or traffic volume within the Port; the development of the Unified Passenger Terminal and associated changes in traffic have been assessed under the MP2 Project. Nonetheless, it is prudent to consider traffic volume and traffic flow in the Port as part of the ABR2 Project.

[4] The CSO describes Small Areas as "the lowest level of geography for the compilation of statistics in line with data protection". In urban areas, with a relatively high population density, Small Areas also represent the *smallest* (in area) level of geography.

Road traffic within the Port has been surveyed in recent years to inform parts of the Dublin Port Masterplan, including surveys in support of the application for the MP2 Project (north side of the Port) and 3FM Project (south side of the Port). The purpose of these traffic surveys was to characterise and quantify the volume of traffic, rather than to quantify the number of people within the Port, and therefore it did not explicitly determine either the occupancy of the vehicles or the overall vehicle population in the Port. To consider whether the previous traffic surveys *within* Dublin Port remain appropriate for estimating the overall societal risk, the changes in the following have been examined as a proxy for changes in traffic volumes within the Port:

- The National Transport Authority and Dublin City Council annual surveys of traffic crossing the Grand Canal and Royal Canal into the city centre (the Canal Cordon).
- The NTA and DCC traffic surveys of inbound people movements across the M50 cordon.
- Transport Infrastructure Ireland monthly traffic counts on specific parts of the national road network, including traffic count data at the Dublin Port Tunnel toll booths.
- Trade statistics for Dublin Port, primarily related to the number of trade units rather than simply the tonnage of trade (unitised trade, Lo-Lo freight).

The Canal Cordon Report 2023 (the most recent publicly available report) provides a summary of vehicle and pedestrian movements across the cordon between 2006 and 2023, broken down by mode of transport. The data from the Canal Cordon Report shows that there has been a general decline in car and goods vehicle movements across the Canal Cordon over the last ten years, with a slight increase in bus movements. The M50 Cordon Report 2024 provides similar historic data on vehicle and passenger movements across the M50 Cordon since 2019, albeit that the data does not include goods vehicle movements, showing a slight decline in car movements and an increase in bus movements. Transport Infrastructure Ireland maintains data on traffic using the Dublin Port Tunnel (via toll data). The TII data shows that there has been a steady increase in traffic using the tunnel, with the exception of 2020 and 2021.

The traffic count data from the NTA, DCC and TII provides a usual overall context for traffic movements in and around Dublin City Centre and in the general vicinity of the Port, but does not provide sufficient information to characterise changes in traffic, if any, within the Port itself. Therefore, it is more appropriate to consider the trade data for Dublin Port as a more representative proxy for traffic.

The trade data most relevant to traffic volumes within the Port – for the purpose of the overall societal risk calculation, rather than a detailed assessment of traffic patterns – is the unitised trade (Ro-Ro and Lo-Lo) data and the Lo-Lo freight data for goods vehicles, and the tourist passenger and tourist vehicle data for other vehicles (primarily cars). The data for unitised trade and Lo-Lo freight shows an increase of approximately 40% since 2016, while the data for tourist passengers and tourist vehicles shows a slight decline since 2016.

Based on the combination of data on Dublin Port trade statistics, as well as the general trends in vehicle movements from the NTA, DCC and TII, the previous road traffic survey data has been revised as follows:

- The volume of goods vehicles is increase by 40%, reflecting the general increase in unitised and Lo-Lo freight.

- Car, bus and other vehicle traffic is unchanged, reflecting a combination of the slight reduction in tourist vehicle traffic, and the general (slight) decline in car traffic overall.

Taking these adjustments into account, the number of people that may be present in vehicles using the Port is based on the following assumptions: (summarised in **Table 6-3**):

- Car traffic accounts for workers. Data from Dublin City Council and the National Transport Authority shows that the average car occupancy is 1.2 per vehicle[5]. The weighted average occupancy is taken to be 1.2 people per car, equivalent to 1.26 people per car during peak times and 1 person per car during off-peak times (refer to **Table 6-3**)
- The car traffic associated with the ferry terminals is accounted for under the ferry traffic data in **Section 6.5.2.7**.
- Goods vehicles are assumed to have a driver and no passengers.
- Buses accessing the port include Dublin Bus serving the ferry terminals (typically a double decker bus with a capacity up to 95 passengers), and private coach services (typically with a capacity up to 55 passengers) either serving the ferry terminals / cruise liners or arriving / departing on the ferries. However, as the majority of passengers using the public or private bus services are arriving or departing passengers, they are accounted for in either the cruise liner traffic or ferry traffic data (refer to **Sections 6.5.2.6** and **6.5.2.7** respectively), and they are therefore not included separately in the road traffic population data. This eliminates / minimises the potential for double counting of the same population.
- Cars and motorcycles travel at an average of 90% of the speed limit (50km/h) during off-peak (quiet times) and at an average of 75% of the speed limit during peak times.
- Goods vehicles and large passenger vehicles travel at an average of 75% of the speed limit during off-peak times and at an average of 50% of the speed limit during peak times.
- Bicycles travel at an average speed of 10km/h.

Table 6-3: Vehicle occupancy, average speed & breakdown by peak/off-peak times

Mode –>		Car	Light goods vehicle	Heavy goods vehicle	Motorcycle	Bicycle
No. occupants	Peak	1.26	1	1	1	1
	Off peak	1	1	1	1	1
Average speed	Peak	37.5	25.0	25.0	37.5	10.0
	Off peak	45.0	37.5	37.5	45.0	10.0
	Peak	52.4	9.7	31.8	1.3	1.4

[5] *Canal Cordon Report 2023 – Report on trends in mode share of vehicles and people crossing the Canal Cordon, 2006 – 2023*, April 2024, National Transport Authority and Dublin City Council.

Mode –>		Car	Light goods vehicle	Heavy goods vehicle	Motorcycle	Bicycle
% of total traffic	Off peak	52.2	6.9	35.7	1.1	1.2
% of traffic mode	Peak	77.3	82.7	75.2	80.0	80.2
	Off peak	22.7	17.3	24.8	20.0	19.8

6.5.2.5 Shipping Traffic

Data from DPC[6] shows that there were approximately 15,100 vessel movements in 2025 (the most recent year of shipping activity), comprising approximately 6,900 vessel arrivals, 6,900 vessel departures, and approximately 1,300 vessel movements within the Port (e.g. moving from one berth to another, or moving to or from anchor). These shipping movements comprise Ro-Ro passenger vessels (ferries), cruise liners, bulk carriers, container vessels, general & Ro-Ro cargo ships, oil & LPG tankers, vehicle carriers, and a wide range of other vessels. Passenger ferries accounted for approximately 39% of all vessel movements, with Ro-Ro cargo vessels accounting for approximately 18%, general cargo, and container vessels each accounting for approximately 10% to 12.5%, and oil/LPG tankers accounting for approximately 5%. The population associated with the shipping traffic (excluding cruise liners and passenger ferries, which are accounted for in **Sections 6.5.2.6** and **6.5.2.7**, respectively) is summarised in **Appendix 6-4**.

6.5.2.6 Cruise Vessels

During 2025, approximately 85 cruise vessels berthed in the Port, comprising 23 different vessels ranging in capacity from 186 (the Island Sky) to 4,212 (the Magnifica). The majority of cruise vessels arrived between May and September (between 10 and 15 vessels per month), with a smaller number of arrivals the autumn/winter/spring months (between 2 and 7 arrivals per month).

The majority of cruise vessels berthed at Cruise 18 (approximately 40%) and MTL 45 (approximately 33%), with the remainder berthing at Alexandra Basin East 39, D.L.2 and D.L.4, and MTL 42. Cruise 18 is up-river of the ABR2 Project at Tom Clarke Bridge / the Eastlink Bridge, and MTL 45 is on the south side of the Port opposite the oil berths.

The estimated cruise vessel population is summarised in **Appendix 6-5**. For the assessment of societal risk, it is conservatively assumed that the passengers remain onboard while the vessel is berthed; due to the distance between the cruise liner berths and the sources of risk at the COMAH establishments, this assumption does not have a significant impact on the assessment.

6.5.2.7 Ferry Traffic

There are four ferry terminals in the Port, summarised in **Table 6-4**.

[6] http://booking.dublinport.ie/webx/

Table 6-4: Dublin Port Terminals

Terminal	Operator	Traffic
1	Irish Ferries Isle of Man Steam Packet Company (seasonal)	Passenger & freight Passenger
2	Stena Line	Passenger & freight
4	CLdN	Ro-Ro freight
5	CLdN Stena Line	Predominantly Ro-Ro, with some passenger

Terminals 1 and 2 are the main passenger ferry terminals, with Terminals 4 and 5 predominantly operating freight / Ro-Ro traffic. Terminals 1, 2 and 5 are located at the eastern end of the Port and are accessed via the main entrance on East Wall Road on to Promenade Road. As access to these terminals is via Tolka Quay Road, all ferry traffic passes the majority of the COMAH establishments on Promenade Road / Tolka Quay Road / Alexandra Road. Terminal 4 is located at the western end of the Port, immediately adjacent to the ABR2 Project area, and is accessed via Tolka Quay Road; traffic to Terminal 4 passes close to Circle K Yard 4 at the junction between Tolka Quay Road and Bond Drive.

The largest passenger ferry operating regularly to / from the Port is the MV Ulysses, which has a capacity of 1,875 passengers, with the slightly larger MS Isle of Inishmore (2,200 passengers) occasionally operating to / from the Port. The other ferries have passenger capacities of between 110 and 1,800 passengers.

Data from DPC for 2025 shows that approximately 1.7 million passengers and 482,000 tourist vehicles passed through the Port (predominantly Terminals 1 & 2), yielding an average vehicle occupancy of 3.53. Approximately two-thirds of the passenger and vehicle traffic occurs during the second and third quarters every year.

To account for the transient and mobile ferry passenger population in the assessment of societal risk, it is assumed that:

1. For departures, the majority of vehicles start to arrive at the terminals approximately 90 minutes prior to the sailing, and they travel at an average of 50% of the speed limit (25km/h). This yields a certain number of people on the road network at any one time over a 90-minute period; the balance of the passengers travelling on the ferry are assumed to be located at the check-in / assembly area at the terminal. In practice, the number of passengers at the check-in / assembly area will vary over the period, starting from zero and increasing to the ferry complement; this approach is therefore conservative.
2. For arrivals, it takes up to 60 minutes for all traffic to disembark the ferry and exit the Port, again assuming that the vehicles travel at an average of 50% of the speed limit. This yields a certain number of people on the road network at any one time over a 60-minute period; the balance of the passengers arriving on the ferry are assumed to be located at the ferry. As in the case of ferry departures, this approach to characterising the transient and mobile population is conservative.

6.5.2.8 Population Timeframes

Table 6-5 summarises the timeframes that have been used to characterise the population in the Port.

Table 6-5: Population Timeframes

Category	Period	Hour/day	Day/week	Hour/week	% of time
Daytime peak traffic	09:00 – 17:00	8	5	40	23.8%
Daytime off-peak traffic	n/a	0	5	0	0.0%
Non-daytime peak traffic	07:00 – 09:00 17:00 – 19:00	4	5	20	11.9%
Non-daytime off-peak traffic	19:00 – 07:00	12	5	60	35.7%
Weekend peak traffic	07:00 – 19:00	12	2	24	14.3%
Weekend off-peak traffic	19:00 – 07:00	12	2	24	14.3%
Other timeframes	Other timeframes for certain populations based on, for example, ferry timetables, berth occupancy data, and other non-standard occupancies that do not fit within the other six categories. The other timeframes are apportioned across the other six categories on a pro-rata basis. For example, if a shipping berth is occupied, on average, for 40% of the year, this occupancy is apportioned between the other six timeframes at the corresponding percentages (23.8%, 0%, 11.9%, 35.7%, 14.3% & 14.3%)				

6.6 EIAR Assessment Methodology

6.6.1 Natural & External Hazards

Natural hazards, such as earthquakes, floods, or storms, can trigger the release of toxic substances, and initiate fires and explosions if they impact industrial installations that process, store, or transport such hazardous materials. This type of event is referred to as a Natech (natural hazard triggered technological) accident.

In 2022, the EU Commission's Joint Research Centre (JRC) published its "Natech risk management – Guidance for operators of hazardous industrial sites and for national authorities". The guidance is aimed at assessing the potential for natural hazards to trigger a major accident, and while such events may be considered as a sub-set of the overall range of major accidents that could arise, the guidance reflects the particular requirements for assessing such natural hazards as distinct initiating events. The guidance was also developed to assist Member States and operators of COMAH establishments to satisfy the requirements of the COMAH Directive (and, in an Irish context, the COMAH Regulations) in context of natural hazards.

The JRC guidance notes that the characteristics of Natech events differ from those of technological accidents (e.g. failure of an item of plant or equipment, operator error, or process deviation). It sets out the key characteristics of Natech events to be taken into account in Natech risk assessment and management:

- Some natural hazards can affect large areas, hitting several hazardous industrial sites and installations at the same time, e.g. earthquakes, floods, storms).

- Natural events can affect engineered protection barriers, e.g. containment dikes, gas detectors, alarms, backup power generators, water sprinkler systems.
- Natural events can disrupt auxiliary systems and utilities, e.g. power, water, communication lines.
- Standard emergency response measures may not be functional or appropriate during an accident caused by a major natural event.
- Natural hazards can aggravate the consequences of Natech accidents by creating secondary hazards or by expanding the accident's impact zone, e.g. releases into floodwaters can spread hazardous materials over wide areas and therefore increase the pollution or fire risk.
- Compared to other types of technological accidents, Natech accidents feature a higher likelihood of domino effects.
- Natural hazards can trigger cascading effects that may cause a secondary natural hazard to affect the industrial site, e.g., heavy rain causing a landslide; earthquake triggering a tsunami.
- Natural hazards are changing in time and location due to climate change, and anticipation of, and adaptation to such changes are needed for effective Natech risk management.

While Natech events are set out in the context of COMAH establishments, they are equally relevant to non-COMAH facilities and other activities, and therefore they have been examined more broadly in this EIAR rather than solely in the context of the nine COMAH establishments. The assessment of natural and external hazards relevant to the ABR2 Project is set out in **Section 6.7.2**.

6.6.2 COMAH Major Accidents

6.6.2.1 COMAH Land Use Planning Guidance

For COMAH-related risks, the HSA's policy and approach to conducting land use planning assessments is to adopt a conservative and consistent approach. In assessing the risk, the HSA examines both the individual (see **Section 6.6.2.2**) and the societal risk (see **Section 6.6.2.3**). In both cases, the risk is estimated based on the HSA's guidance and is compared against the HSA's assessment criteria.

6.6.2.2 Individual Risk

The level of individual risk is assessed using a three-zone traffic light system shown in **Table 6-6**.

Table 6-6: Risk Based Contour Zones for Individual Risk

Zone	Risk of fatality per year		
Inner	1×10^{-5}	1 in 100,000	0.001%
Middle	1×10^{-6}	1 in 1 million	0.0001%
Outer	1×10^{-7}	1 in 10 million	0.00001%

The HSA provides its advice to planning authorities in the form 'advises against' or 'does not advise against' depending on which zone (from **Table 6-6**) the development lies within, as shown in **Table 6-7** (a tick indicating 'do not advise against' and a cross indicating 'advise against').

Table 6-7: HSA Matrix for Land Use Planning Advice

Sensitivity Level	Inner Zone	Middle Zone	Outer Zone
Level 1	✓	✓	✓
Level 2	✗	✓	✓
Level 3	✗	✗	✓
Level 4	✗	✗	✗

These three zones have been determined for the COMAH establishments in the Port based on the scenarios identified and the results from the consequence assessment as described in **Section 6.7.3**. The land use in each of the three zones is assessed against the four levels (categories) of development to assess whether the land use is 'compatible' with the level of risk. Level 1 type developments (comprising, for example, workplaces and car parks) are considered to be less sensitive to risk, with the sensitivity to risk increasing to Level 4 type developments (very large and / or sensitive land use, such as hospitals, schools, and sports stadia). These development sensitivity levels are described in **Section 6.6.2.7**.

6.6.2.3 Societal Risk

Societal risk is a measure of the risk of large numbers of people being affected in a single accident. The HSA's guidance notes that:

> "…The advice matrix… takes account, to a degree, of group risk and the varied receptor sensitivities. It is applicable for the specified developments … that are located near a single COMAH establishment, and where the existing societal risk is well within the tolerable limit. However, there are times when the risk of multiple fatalities from an accident – societal risk – should be taken into account more explicitly. For example, this may include where an application relates to a proposed significant off-site population density, or where there is already a significant population residing/working within the risk zone, or where the risk is emanating from more than one establishment."

There are several metrics that can be applied to estimate and assess societal risk; the two approaches described in the HSA's guidance are:

- Expectation Value
- FN curve

6.6.2.3.1 Expectation Value

The Expectation Value (EV) is the product of the frequency of an accident (expressed in 'chances per million') and the number of people exposed to lethal effects as a result of that accident. The HSA's guidance sets out several criteria for assessing the EV:

- between 100 and 10,000: it should be demonstrated that all practicable efforts have been made to reduce the risk to a level that is as low as reasonably practicable
- greater than 10,000: should not be exceeded; if the EV exceeds 10,000, the TLUP advice to the planning authority will always be 'advise against'
- developmental EV value is greater than 450: an FN curve will be required as part of the demonstration that all practicable efforts have been made to reduce the risk to a level that is as low as reasonably practicable.
- greater than 2,000: for new developments near an establishment further assessment of societal risk will be required and the creation of an FN curve and calculation of the total EV will be necessary.

6.6.2.3.2 FN Curve

An FN curve shows the relationship between the frequency of an outcome and the cumulative severity of the outcome, typically plotted on a log-log scale to account for the range of values for both the frequency of occurrence and the severity of the outcome. It can take one of two forms[7]:

1. Non-cumulative frequency basis: for these graphs, called f-N curves (lower case 'f'), the value plotted on the y-axis is the discrete frequency of experiencing exactly N fatalities.
2. Cumulative frequency basis: for these graphs, called F-N curves (upper case 'F'), the value plotted on the y-axis is the cumulative frequency of experiencing N or more fatalities.

When assessing whether the level of societal risk may be regarded as tolerable, it is necessary to select appropriate criteria. In its guidance, the HSA identifies two criterion lines for FN (cumulative frequency) curves:

- an upper criterion of 1 in 5,000 for 50 fatalities; and
- a lower criterion line of 1 in 100,000 for 10 fatalities.

Figure 6-2 shows the general format of an FN curve, with the number of (potential) fatalities, N, on the x-axis and the probability of at least N fatalities on the y-axis, F, together with the two criterion lines. The area above the upper criterion is considered to be the intolerable region and the area below the lower criterion line is considered to be the broadly acceptable region. The area between the two lines is generally considered to be the ALARP region, where the risk may be considered to be 'tolerable' provided that it is As Low As Reasonably Practicable (ALARP)[8] .

[7] Guidelines for Developing Quantitative Safety Risk Criteria, Centre for Chemical Process Safety, 2009
[8] The UK HSE provides a commentary on the use of the term as low as reasonably practicable (ALARP), and a similar term so far as is reasonably practicable (SFAIRP). It notes that SFAIRP is most often used in the context of workplace health and safety legislation and that ALARP is used by risk specialists. The HSE uses the term ALARP in its COMAH guidance and, in its view, considers that the two terms are (generally) interchangeable.

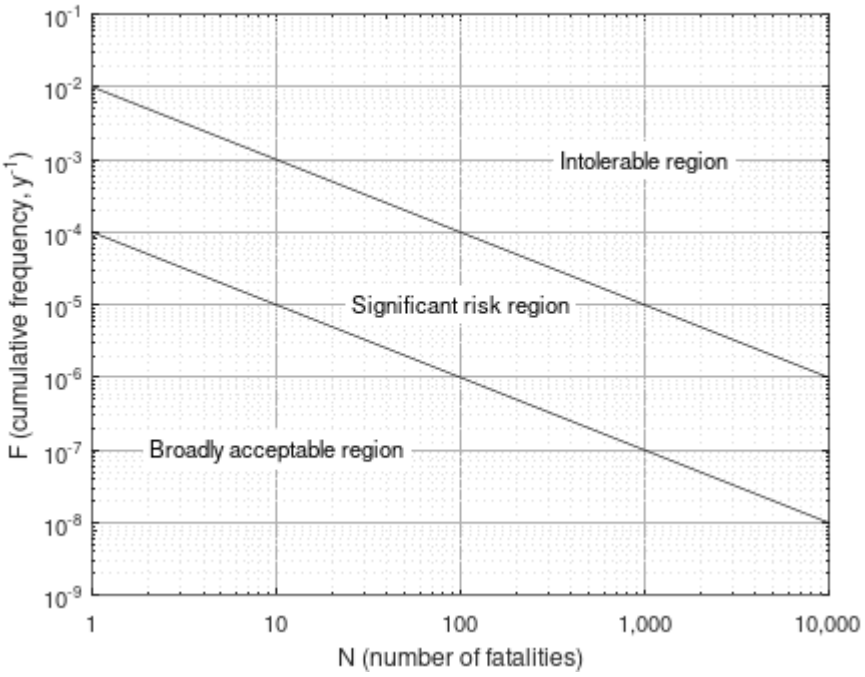


Figure 6-2: Criterion Lines for FN Curves

There are other reference sources for the criteria that may be used to assess whether the level of societal risk is tolerable or not. In their review of societal risks and the use of FN curves and 'criterion lines' for the UK Health and Safety Executive (HSE), Ball and Floyd[9] note that:

> "Societal risk criteria should not, in other words, be viewed as more than broad indicators of a desirable objective, with many other, non-technical factors needing to be weighed in any final decision."
>
> "…In short, the estimation of societal risks, in all their dimensions, is fraught with numerous uncertainties. For this reason, it is eminently sensible to regard societal risk criteria as no more than indicators."
>
> "… the proposal here is that societal risk criteria should not be used in a 'prescriptive mode'..."
>
> "given the degree of uncertainty associated with the determination of societal risks, it is widely accepted that societal risk criteria (in the form of FN lines) should be regarded as no more than indicators or guidelines."

[9] Ball, David J. and Floyd, Peter J., Societal Risks – Final Report (1998) commissioned by the UK Health and Safety Executive

6.6.2.4 Consequences

6.6.2.4.1 Risk of Fatality

The risk of fatality arising from a major accident hazard can be related to the consequences of the event by means of probit functions and other derived relations. The consequences of an event on people generally fall into one of the following impacts:

- exposure to thermal radiation from a fire, expressed in kilowatts per square metre (kW/m²)
- exposure to an overpressure from an explosion, expressed in millibar (mbar) or pounds per square inch (psi)
- exposure to a toxic substance, expressed as a concentration (mg/m³ or parts per million)

In assessing the potential impacts associated with COMAH establishments, the HSA also considers the potential impacts on the environment (see **Section 6.6.2.4.4**) and impacts on buildings and structures (see **Section 6.6.2.4.5**).

As described in the UK HSE's "Methods of approximation and determination of human vulnerability for offshore major accident hazard assessment", probits account for the variation in tolerance to harm for an exposed population, with the fatality rate of personnel exposed to harmful agents calculated using a probit function of the general form:

$$Y = k_1 + k_2 \times ln(V)$$

where:

- Y is the probit, a measure of the percentage of the vulnerable resource that might sustain damage (the probability of fatality).
- k_1 & k_2 are constants depending upon the type of harm that the population is exposed to (thermal, pressure, toxic effects).
- V is the product of intensity (I) or concentration (C) of the received hazardous agent to an exponent n and the duration of exposure in seconds or minutes (t). In other words, $V = C^n \cdot t$.

The probit function can be used to calculate the risk to people exposed to the hazardous agent (thermal radiation, overpressure or concentration of toxic substance), expressed as a probability of lethal impacts, as follows:

$$Probability = \frac{1}{\sqrt{2\pi}} \int_{u=-\infty}^{u=Y-5} exp\left(-\frac{u^2}{2}\right) du$$

For example, a probit value of 5 corresponds to a probability of fatality of 50%, while probit values of 3.72 and 6.28 correspond to probabilities of fatality of 10% and 90%, respectively.

6.6.2.4.2 Thermal Effects

The probit function for thermal effects on people is:

$$Y = -14.9 + 2.56 \times ln\left(I^{4/3} \times t\right)$$

In this equation, I is the thermal flux expressed in kilowatts per square metre (kW/m²) and the time t is expressed in seconds. For short duration fire events, such as a fireball from a boiling liquid expanding vapour explosion (BLEVE) at an LPG facility, the time during which people may be exposed to the thermal radiation is set at the duration of the event. For longer duration events, such as bund and pool fires, the duration is set at 60 seconds to take account of the time required for people to escape from the area.

For people located indoors, the HSA advises that the building may provide some protection from the fire and that this should be taken into account.

- For exposure to fluxes in excess of 25.6kW/m², the building is conservatively assumed to catch fire quickly and a 100% fatality risk is applied.
- For exposure to fluxes less than 12.7kW/m², the people inside the building are assumed to be protected and a 0% fatality risk is applied.
- For exposure to fluxes in between these two values, people are assumed to escape outdoors and, therefore, have a risk of fatality corresponding to that outdoors.

6.6.2.4.3 Overpressure Effects

The probit function for overpressure effects on people is:

$$Y = 1.47 + 1.35 \times ln(P)$$

Unlike the probit for thermal effects, the probit for overpressure effects is only related to the overpressure (P) expressed in pounds per square inch (psi).

6.6.2.4.4 Major Accidents to the Environment (MATTE)

The HSA's guidance provides the following advice on major accidents to the environment (MATTE):

> "In the context of LUP, the prevention of MATTEs will be the primary objective and it is expected that accident pathways will be prevented. Where this is not practicable, or in the context of significant modifications at existing COMAH establishments, the assessment of major accidents to the environment focuses on the specific risks to sensitive receptors within the local environment, the extent of consequences to such receptors and the ability of such receptors to recover."

The ABR2 Project will not result in any changes at or to the COMAH establishments, and therefore the underlying potential major accidents to the environment will not change as part of the design of the ABR2 Project. However, the potential for the ABR2 Project to adversely impact on the COMAH establishments such that the ABR2 Project could either give rise to a MATTE at a COMAH establishment or increase the likelihood of a MATTE at a COMAH establishment due to unforeseen or abnormal events has been considered.

6.6.2.4.5 Impacts on Buildings and Structures

The HSA's guidance notes that property damage may be a relevant element of the technical advice to a planning authority, either from the effects of thermal radiation or from explosion overpressures. For the effects of thermal radiation, the HSA sets out three levels for assessing structural damage (14.7kW/m^2, 25.6 kW/m^2,

and 37.5kW/m^2), and for the effects of overpressures it sets out five levels for assessing structural damage (10mbar, 35mbar, 170mbar, 350mbar, and 830mbar). However, while the HSA sets out these assessment criteria, it also notes that there are no generally accepted criteria for assessing the risk to the built environment, as opposed to the risk to human health, and that the potential impacts on the built environment may be less significant than the risks to people.

As described in **Sections 6.6.2.4.2** and **6.6.2.4.3**, the response of buildings and structure to the effects of thermal radiation and overpressures are accounted for in assessing the risk to people. Given the nature and layout of the Dublin Port estate in the vicinity of the ABR2 Project – a largely outdoor environment with no significant built up areas of occupied buildings – this assessment has focussed on the risks to people located indoors and outdoors, rather than on the buildings and structures themselves.

6.6.2.5 Modelling Software

The loss-of-containment scenarios and corresponding end events (described in **Section 6.7.3.2**) were modelled using the latest version of the Gexcon EFFECTS consequence modelling software (version 13.0.2). Gexcon EFFECTS implements the calculation methods for assessing the physical effects of accidental releases of hazardous materials, described in the "Methods for the calculation of physical effects" (the 'Yellow Book') published by the Dutch Advisory Council on Dangerous Substances. The outputs from the consequence modelling were converted to the equivalent lethal effects using the probit functions described in **Sections 6.6.2.4.1**, **6.6.2.4.2** and **6.6.2.4.3**), and the potential lethal effects associated with all the sources of losses-of-containment were aggregated across the modelling domain to generate the individual risk contours (see **Section 6.6.2.2**) and the societal risk outputs (see **Section 6.6.2.3**). The modelling conditions are described in **Section 6.6.2.6**.

6.6.2.6 Modelling Conditions

The consequences associated with the major accident events (thermal radiation, overpressure) are dependent, to varying degrees, on certain ambient environmental conditions:

- **Wind speed**: Wind speed influences the extent of thermal radiation consequences for pool fire scenarios (primarily the extent of 'flame tilt'), and the extent to which a flammable atmosphere may both migrate from the source and be dispersed. For land use planning assessments, and consequence modelling more generally, it is not practicable to account for all potential wind speeds and therefore a 'standard' set of wind speeds is typically applied. The HSA's guidance advises that wind speeds of 2m/s (representative of low wind speed, nominally calm conditions) and 5m/s (representative of typical wind speeds) are used.
- **Atmospheric stability**: Atmospheric stability, measured on the Pasquill stability scale, is a measure of the stability / instability of the atmosphere, ranging from extremely unstable atmospheric conditions (category A) to extremely stable atmospheric conditions (category G). Atmospheric stability influences the extent to which a gaseous emission (for example a flammable gas cloud) migrates from a source and the extent to which the cloud may be dispersed / broken up. As in the case of wind speed, it is not practicable to account for all potential atmospheric stability conditions, and therefore a 'standard' set

of stability conditions is typically applied. The HSA's guidance advises that category D (neutral conditions) and category F (moderately stable conditions) are used. In practice, atmospheric stability and wind speed are applied together, and the combinations of these two parameters, as advised by the HSA, are D5 and F2 conditions.

- **Temperature**: Temperature influences the extent to which a release of liquid, or in the case of LPG and LNG a release of liquefied gas or cryogenic liquefied gas, may evaporate and form a vapour cloud. The HSA advises that for D5 meteorological conditions a temperature of 15°C is applied, and for F2 meteorological conditions a temperature of 10°C is applied.
- **Humidity**: Humidity influences the attenuation of thermal radiation and may have a secondary influence on dispersion. For dispersion, humidity affects air density and buoyancy, which in turn influences how a released gas or vapour mixes with the atmosphere. High humidity can also affect the evaporation rate of liquid spills. For fire scenarios, moisture in the atmosphere absorbs infrared radiation and therefore more humid air tends to attenuate the thermal radiation at a receptor. The HSA's guidance does not specify a level of humidity; therefore, for this assessment the long term (20-year) average humidity from the meteorological stations at Dublin Airport and the Phoenix Park (2006 to 2025) has been used, separated into day-time humidity (74.7%) and night-time humidity (88.6%) to align with D5 and F2 meteorological conditions.
- **Cloud cover**: Cloud cover is used for the calculation of the solar heat radiation, which in turn influences the transmission of energy and therefore affects the extent of evaporation of pools. At 100% cloud cover, the solar heat flux is taken to be 0% (no solar gain). The HSA's guidance does not specify a level of cloud cover; therefore, for this assessment the long term (20-year) average cloud cover from the meteorological stations at Dublin Airport and the Phoenix Park (2006 to 2025) has been used, separated into day-time cloud cover (72.9%) and night-time cloud cover (67.0%) to align with D5 and F2 meteorological conditions.
- **CO_2 concentration**: The concentration of CO_2 in the atmosphere affects the level of atmospheric transmissivity (the extent to which thermal radiation is transmitted in the atmosphere), and therefore influences the extent of thermal radiation for the fire scenarios. The HSA's guidance does not specify a CO_2 concentration; therefore, for this assessment the average CO_2 concentration from 2025 for the Mace Head monitoring station under the Integrated Carbon Observation System (ICOS) has been applied for both D5 and F2 meteorological conditions (426.2 ppm, or 0.0426%).
- **Surface roughness**: The surface roughness is an empirical parameter that describes the wind speed over a surface and characterises the roughness of the surface. A higher surface roughness gives rise to turbulent dispersion effects, which in turn influences the nature and extent of the dispersion of vapour clouds. The surface roughness is intended to be representative of land the surrounding the source of a release, and therefore is location/project specific. For Dublin Port, the surface roughness is conservatively taken to be equivalent to *parkland, bushes, numerous obstacles* (a roughness length of 0.5 m) to reflect both the land-side landscape and the surrounding water.

The ambient modelling conditions used in this assessment are summarised in **Table 6-8**.

Table 6-8: Ambient modelling conditions

Parameter	'Typical' (D5) conditions	'Calm' (F2) conditions
Wind speed	5m/s	2m/s
Atmospheric stability	D	F
Temperature	15°C	10°C
Humidity	74.7%	88.6%
Cloud amount	72.9%	67.0%
CO_2 concentration in the atmosphere	0.0426%	0.0426%
Surface roughness	Parkland, bushes, numerous obstacles	

In addition to the wind speed (set at 5m/s and 2m/s under the HSA's guidance), the wind direction also influences the impacts of the consequences for certain scenarios, notably the dispersion of vapour giving rise to either flash fires or vapour cloud explosions. The meteorological station at Dublin Airport records wind direction on an hourly basis, and the wind rose for Dublin Airport for the period 2006 to 2025 has been used in this assessment to account for the influence of wind direction on the individual risk contours and the societal risk assessment. The wind rose is shown in **Figure 6-3**.

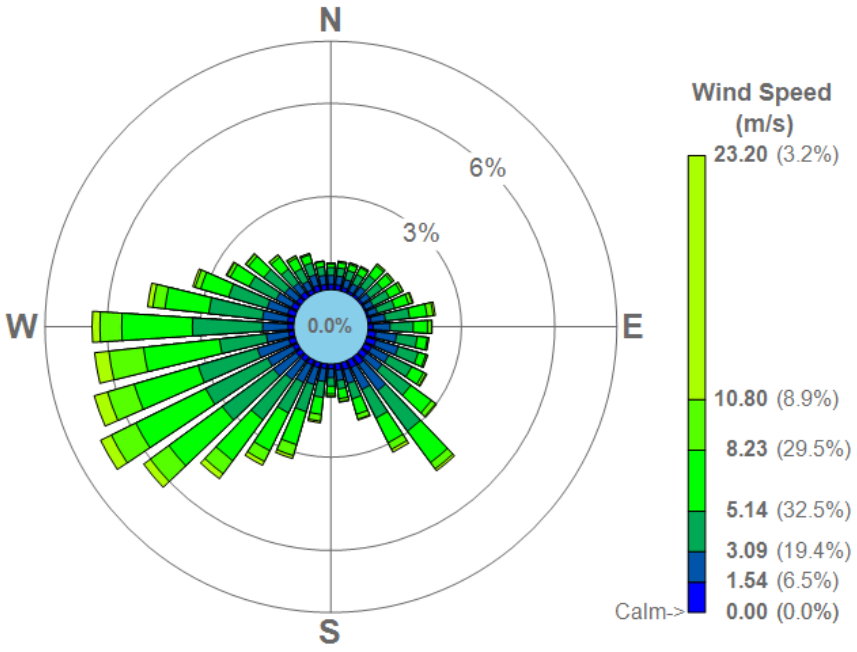


Figure 6-3: Dublin Airport Wind Rose (2006 – 2025)

6.6.2.7 Development Sensitivity Levels

The HSA provides advice to the planning authorities using the approach described in **Section 6.6.2.2**. Under this approach, the type of development in the vicinity of a COMAH establishment is examined to determine its development sensitivity level, and the development sensitivity level is compared against the individual risk zones around the COMAH establishment (or establishments). For new COMAH establishments, or changes at existing establishments, the HSA considers whether the change in the risk will be compatible with the

existing surrounding environment. For non-COMAH developments in the vicinity of COMAH establishments – such as the ABR2 Project – the HSA considers with the proposed development is compatible with the existing risk associated with the existing COMAH establishments.

The development sensitivity levels are categorised as follows:

- Level 1: people at work, car parks (workplaces and parking areas).
- Level 2: developments for use by the general public (housing, hotel / hostel / holiday accommodation, transport links, indoor use by the public, outdoor use by the public).
- Level 3: developments for use by vulnerable people (institutional accommodation and education, prisons).
- Level 4: very large and sensitive developments (institutional accommodation, very large outdoor use by the public).

Table 6-9 provides a summary of the four sensitivity levels and examples of the types of development for each, as relevant to the ABR2 Project.

Table 6-9: Summary of development types for Land Use Planning Zones

Zone	Development Type	Description / Example
Inner	Workplaces	Workplaces (predominantly non-retail) providing for fewer than 100 occupants in each building and fewer than three occupied storeys
	Parking areas	Parking areas with no other associated facilities (other than toilets)
	Estate roads / access roads	Single carriageway roads
	Indoor use by public	Developments for use by the general public where total floor space is less than 250m² (e.g. restaurants and cafés, shops, petrol filling stations, coach / bus stations, ferry terminals)
Middle	Large workplaces	Workplaces (predominantly non-retail) providing for 100 or more occupants in any building or 3 or more occupied storeys in height
	Transport links	Major transport links in their own right, i.e. not as an integral part of other developments (e.g. motorway, dual carriageway)
	Indoor areas for use by the general public	Developments for indoor use by the general public where total floor space is from 250m² up to and 5,000m² (e.g. restaurants and cafés, shops, petrol filling stations, coach / bus stations, ferry terminals)
	Outdoor areas for use by the general public	Principally an outdoor development for use by the general public, i.e. developments where people will predominantly be outdoors and not more than 100 people will gather at any one time (e.g. picnic areas, outdoor markets, open-air exhibitions, ferry terminals, marinas)
Outer	Indoor areas for use by the general public	Developments for indoor use by the general public where total floor space is more than 5,000m² (e.g. restaurants and cafés, shops, petrol filling stations, coach / bus stations, ferry terminals)
	Outdoor areas for use by the general public	Principally an outdoor development for use by the general public, i.e. developments where people will predominantly be outdoors and greater than 100 people up to 1,000 people will gather at any one time (e.g. picnic areas, outdoor markets, open-air exhibitions, ferry terminals, marinas)
Outside all zones	Very large outdoor use by public	Predominantly open-air developments where there could be more than 1,000 people present (e.g. theme parks, open air markets)

6.6.3 Non-COMAH Major Accidents

The COMAH Regulations only apply to establishments that store, handle or process dangerous substances above certain thresholds; the Regulations do not apply to:

- the transport of dangerous substances by road, rail, internal waterways, sea or air outside establishments, including loading and unloading and transport to and from another means of transport at docks, wharves or marshalling yards; or
- the transport of dangerous substances in pipelines, including oil and natural gas pipelines, outside establishments.
- the non-COMAH establishments within the Port

The potential for major accidents or disasters to arise either at the non-COMAH establishments or from the transport of dangerous substances by pipeline or by road and to impact on the ABR2 Project, or for the ABR2 Project to give rise to a major accident or disaster that could impact on other parts of the Port have been examined qualitatively, taking into account the principle of the HSA's COMAH land use planning guidance, the nature of the other (non-COMAH) sites and activities within the Port, and the potential for natural and external hazards to contribute (see **Section 6.6.1).**

6.7 EIAR Assessment

6.7.1 Overview

The potential for major accidents and disasters to impact on the ABR2 Project, or for the ABR2 Project to give rise to major accidents and disasters, is assessed in the following sections:

1. Natural and external events
2. COMAH major accidents
3. Non-COMAH major accidents

6.7.2 Natural & External Events

6.7.2.1 Introduction

Natural and external events have the potential to adversely impact on any development, either individually or in combination with others to exacerbate the impact or to initiate other events. The natural and external events that have been considered for the ABR2 Project are described in the following sub-sections, taking into account the presence of the COMAH establishments and other activities within the Port from a domino risk perspective; the COMAH events are assessed in **Section 6.7.3** and the other non-COMAH events are assessed in **Section 6.7.4**. As noted in **Sections 6.4.1.1** and **6.4.1.3**, other Chapters of the EIAR consider specific hazards and potential adverse impacts on the Project, including flooding in **Chapter 9 Water Quality and Flood Risk Assessment** and climate change in **Chapter 11 Climate**.

6.7.2.2 Earthquakes

The School of Cosmic Physics (part of the Dublin Institute for Advanced Studies – DIAS) operates the Irish National Seismic Network (INSN), which comprises a series of monitoring stations around the country. **Figure 6-4** shows the location and magnitude of historic and recorded seismic events in Ireland since 1980. This shows that while there have been several recorded seismic events, they are all of low or very low magnitude (typically less than magnitude 1.9), with the largest concentration in the northwest, the southeast, and off the east coast in the Irish Sea.

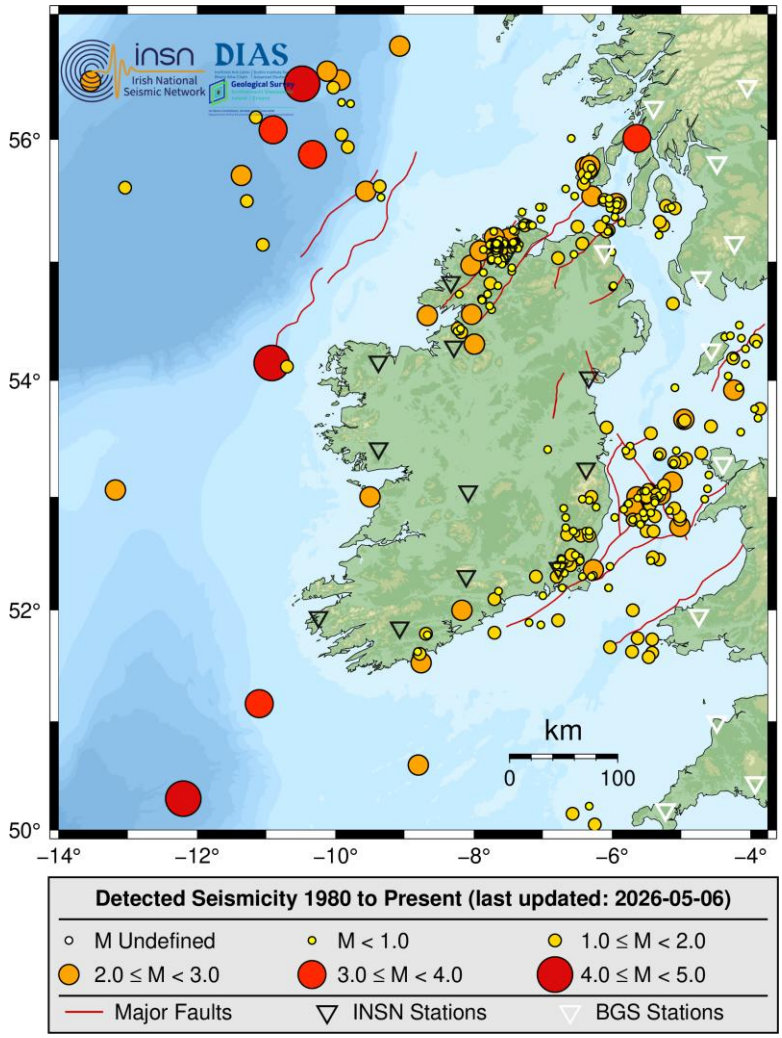


Figure 6-4: Historical & Recorded Seismic Events since 1980 (source: INSN)

The INSN database of seismic events shows that there have been no recorded earthquakes within, or in the vicinity of the ABR2 Project; the closest recorded earthquake events occurred approximately 25km offshore in the Irish Sea with Richter scale magnitudes of 0.5 to 1.5. The INSN database also records seismic events attributed to quarry blasting (and similar activities), with several events recorded in the vicinity of the ABR2

Project and the surrounding area. The closest event[10] was recorded to the south of Alexandra Road at R&H Hall (north of Alexandra Basin) on 20th December 2018, with a Richter scale magnitude of 1.2.

Seismic events in the order of 0.5 to 1.5 are not felt by people under normal circumstances and are generally only detected by sensitive seismographs. For buildings and other structures, a magnitude of 1.0 to 1.5 poses a negligible risk, as the corresponding ground motion is below the threshold at which they may experience movement or damage.

The Seismic Hazard Harmonization in Europe (SHARE) project, was a collaborative project in the Cooperation programme of the Seventh Framework Program of the European Commission, which developed a seismic hazard model for Europe. The project was completed in 2013, and since then the European Facilities for Earthquake Hazard and Risk (EFEHR) consortium has continued and further developed the assessment and modelling of earthquake hazard and earthquake risk. Earthquake (or seismic) hazard describes the level of ground shaking at the earth's surface expected due to potential future earthquakes, while earthquake risk describes the potential impact on the built environment and on people's well-being due to future earthquakes. The EFEHR has developed earthquake hazard and earthquake risk models for Europe, which show that Ireland is in a low hazard area, and that there is a low to very low earthquake risk. **Figure 6-5** shows the earthquake hazard and risk models for Europe.

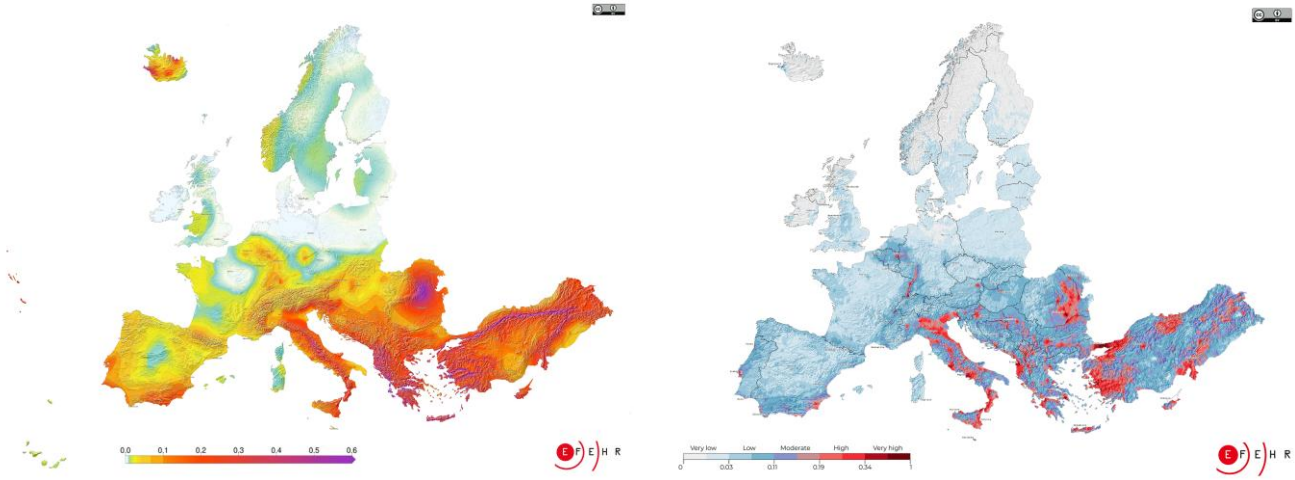


Figure 6-5: Earthquake hazard (left) and risk (right) models (source: EFHER)

6.7.2.3 Lightning Strikes

The UK Met Office has operated a lightning location network since 1987 (ATDnet), which allows for the detection of lightning activity across Europe and in turn the development of maps showing the density of lightning strikes. A 2020 research paper[11] analysed the data from the network and produced the lightning flash density map shown in **Figure 6-6**. This shows that, in general, Ireland is an area of relatively low lightning activity.

[10] INSN notes that in some instances the locations of seismic events may have uncertainties of several kilometres.
[11] Sven-Erik Enno, Jacqueline Sugier, Regina Alber, Mark Seltzer, *Lightning flash density in Europe based on 10 years of ATDnet data*.

An earlier (2014) research paper[12] also analysed the data from the network and noted that:

> "Over the UK, Ireland and Scandinavia the densities are generally lower than the rest of Europe. Some of the lowest densities are observed over the Atlantic, North Sea and Baltic Sea."

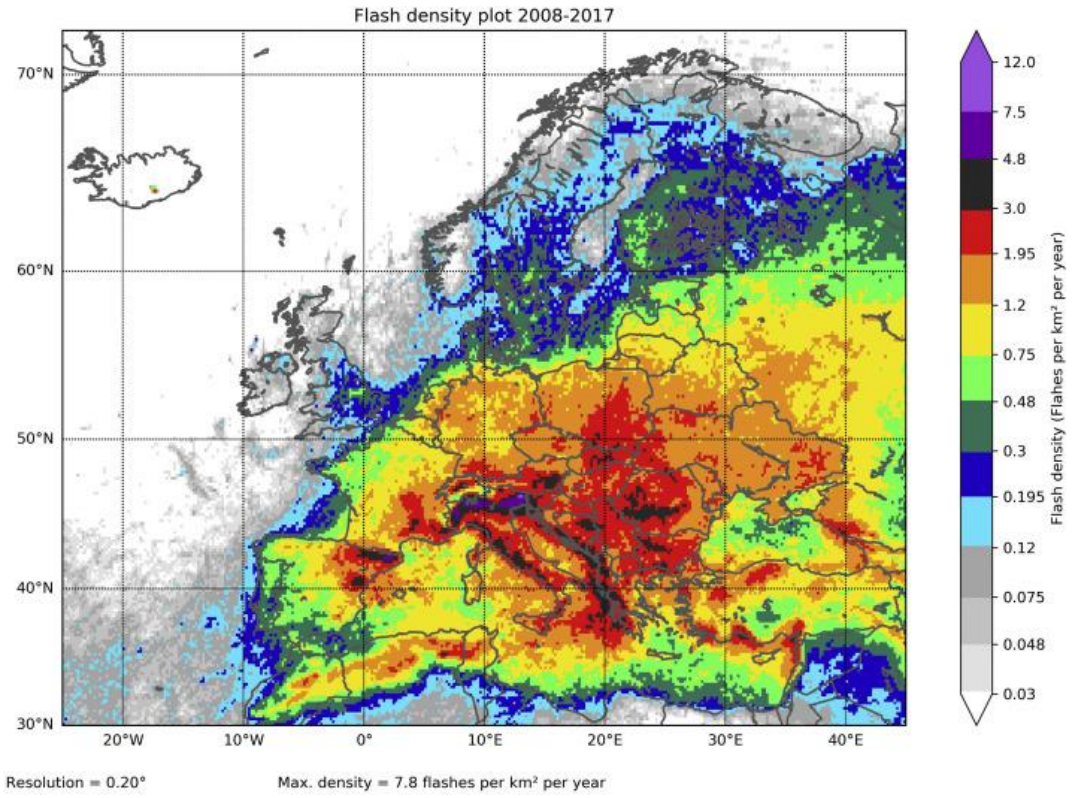


Figure 6-6: Annual Detected Lightning Flash Density

6.7.2.4 Flooding

The Office of Public Works (OPW) National Flood Hazard Mapping system provides details of historic flooding incidents throughout the country. For the Dublin Port estate, the system identifies multiple flood events within approximately 2.5km of the Port, none of which are within the Port estate or in the vicinity of the ABR2 Project with the exception of a small area at the Northwall Quay Lighthouse (at Berths 21 & 25 in Alexandra Basin) that is shown to have flooded during the flood event in February 2002. The reports on the 2002 flood event do not provide any further detail on the extent or impact of flooding in this part of the Port.

The Dublin Port Masterplan 2040, most recently reviewed in 2018, notes that several historic flood events have been recorded near to or in the vicinity of the Port estate, acknowledging that it is generally considered that flood risk will continue to increase in line with predicted climate change.

One of the outputs from the Eastern Catchment Flood Risk Assessment and Management (CFRAM) study is a series of flood maps that show the predicted flood extent for flood events with a range of estimated

[12] G. Anderson & D Klugman, 2014, *A European lightning density analysis using 5 years of ATDnet data*.

probabilities of occurrence (0.1%, 0.5%, 1% Annual Exceedance Probability – AEP). The AEP represent the probability of an event of this, or greater, severity occurring in any given year.

For the area of the ABR2 Project and surrounding environment, flood maps are shown for both coastal and fluvial (river) events. The maps indicate that the land-side area is not at risk from fluvial flood events, but that the river channel and basins (including Alexandra Basin) are susceptible to flooding (higher water levels) in the order of 1.5m to 2m. The flood maps also show that parts of the land-side area at the ABR2 Project may experience flooding under the low probability (0.1% AEP) event in the order of 0.25m to 0.5m, with the potential flooding under the medium probability (0.5% AEP) and high probability (10% AEP) coastal flood events largely confined to the river channel and basins..

There is no history of flooding at the COMAH establishments in Dublin Port. If flooding did occur at a COMAH establishment, it is not expected to give rise to a major accident that could impact on the ABR2 Project (or other areas of the Port), although it is likely that it would disrupt normal operational activities at the particular site for the duration of the event.

A Flood Risk Assessment for the ABR2 Project is presented in **Chapter 9 Water Quality and Flood Risk Assessment** of this EIAR.

6.7.2.5 Extreme Weather Events

6.7.2.5.1 Meteorological Station

The closest meteorological stations to Dublin Port and the ABR2 Project are the Phoenix Park station, approximately 8.5km to the west, and the Dublin Airport station, approximately 8.8km to the north. Both stations record hourly and daily data for certain meteorological parameters, with the Dublin Airport station recording data for more parameters relevant to this assessment. Extreme (or abnormal) meteorological events, such as high or low temperatures, prolonged hot or cold periods, high winds, or heavy rainfall, have the potential to contribute to or exacerbate major accidents. This assessment of major accidents and disasters has taken into account the potential for extreme weather events to cause, contribute to, or exacerbate, a major accident, based primarily on the data from the Dublin Airport station.

6.7.2.5.2 Temperature

The maximum daily air temperature at the Dublin Airport weather station over the period 2006 to 2025 (the latest 20-year period) was 29.1°C on 18th July 2022, with a minimum daily air temperature of -12.2°C on 25th December 2010. The largest daily temperature range over the period was 19.5°C, varying from a low of 5.5°C to a high of 25°C on 2nd June 2020. The Phoenix Park station recorded similar temperature results over the same period, with a maximum daily air temperature of 33.0°C on 18th July 2002, and a minimum daily air temperature of -10.8°C on 25th December 2010. The largest daily temperature range at the Phoenix Park station was also recorded on 2nd June 2020, with a range of 19.1°C (from a low of 6.9°C to a high of 26.0°C).

Met Éireann defines a heatwave as five consecutive days or more with a maximum temperature over 25°C. No heatwaves have been recorded at Dublin Airport in the last 20-years. A single heatwave has been recorded at the Phoenix Park station, lasting seven days from 16th to 22nd July 2006, and with a high of 27.9°C. While there is only a single recorded heatwave at either station, both have experienced prolonged periods with a

maximum temperature above 20°C (periods of up to 24 days), and shorter periods with a maximum temperature above 25°C (1 to 4 days).

There is no equivalent definition for a prolonged cold period ('cold spell'); over the period 2006 to 2026, there have been multiple periods of low minimum temperatures (less than 0°C) on consecutive days at both stations, the longest of which was over 16 days at both stations between 24th November and 9th December 2010:

- Phoenix Park: a minimum of -8.3°C and a maximum of 5.6°C
- Dublin Airport: a minimum of -8.4°C and a maximum of 5.8°C

No major accident or disaster scenarios are envisioned in which either low or high ambient temperatures, or prolonged low or high temperatures, would significantly change the likelihood of the scenario.

6.7.2.5.3 Wind

Wind data (speed and direction) from the Dublin Airport weather station is summarised in **Table 6-10** and shown in **Figure 6-7** for the period 2006 to 2025. The wind rose in **Figure 6-7** is based on 10° incremental data and shows that the prevailing wind direction is from 240°, nominally from the southwest.

Table 6-10: Wind Speed Data for Dublin Airport (2006 to 2025)

Direction (from)	All wind speeds	0 – 2m/s (0 – 7.2km/h)	2 – 5m/s (7.2 – 18km/h)	5 – 10m/s (18 – 36km/h)	> 10m/s (> 36km/h)
North	5.0%	0.8%	2.7%	1.4%	0.1%
Northeast	5.0%	0.3%	2.6%	2.0%	0.1%
East	9.8%	0.9%	5.5%	3.1%	0.3%
Southeast	13.1%	1.1%	6.6%	5.0%	0.5%
South	9.4%	0.9%	4.0%	4.0%	0.5%
Southwest	22.0%	0.7%	8.3%	11.3%	1.7%
West	27.9%	1.0%	10.6%	13.9%	2.4%
Northwest	7.8%	0.7%	3.9%	3.1%	0.2%
Total	5.0%	6.5%	44.2%	43.7%	5.6%

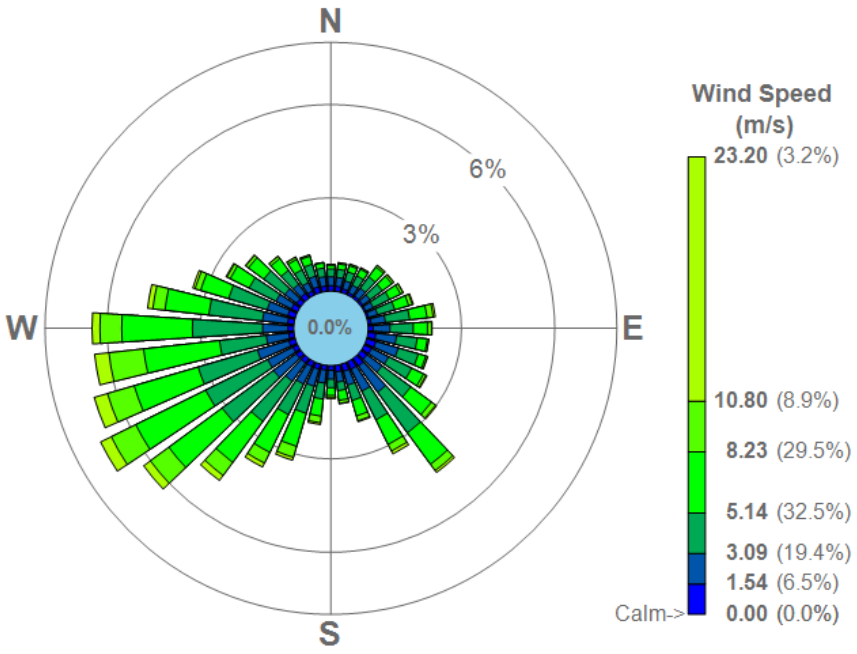


Figure 6-7: Dublin Airport Wind Rose (2006 – 2025)

The mean wind speed over the period was 10.2 knots (5.2m/s; 18.8km/h), with a maximum hourly average wind speed of 29.2 knots. More generally, data from Met Éireann shows that the typical maximum gust speeds for a 50-year return period are in the order of up to 50m/s (180km/h) depending on the location of the site in Ireland. For Dublin Airport, the highest gust over the period 2006 to 2025 was 80 knots (148.2km/h), and the highest 10-minute mean wind speed was 53 knots (98.2km/h), with both occurring in 2007; in recent years, the maximum gusts speeds and maximum 10-minute mean wind speeds have been in the order of 50 to 65 knots, and 30 to 45 knots, respectively.

The wind speeds typically experienced in Dublin do not significantly influence the likelihood of a major accident or disaster, albeit that high winds and sustained high winds may be disruptive to activities in the Port and to COMAH establishments.

6.7.2.5.4 Rainfall

The average annual rainfall at Dublin Airport over the period 2006 to 2025 ranged from 661mm (in 2017) to 1,001mm (in 2023), with a 30-year annual average (1991 to 2020) of 772.5mm. The highest total daily rainfall over the period 2006 to 2025 was 84mm, recorded on 2nd August 2014, and the longest prolonged period of wet weather (days on which precipitation was recorded) was 23 days, which occurred between 24th November and 16th December 2018 during which 91mm of rainfall was recorded. The highest cumulative rainfall amount over consecutive days was 187.3mm over 17 days between 28th July and 13th August 2008. On average, there are between 200 and 240 days per year with recorded rainfall.

The longest period during which no rainfall occurred was over 24 days between 21st June and 14th July 2018.

A period of prolonged dry or wet weather is not expected to give rise to or exacerbate a major accident or incident, albeit that periods of heavy or sustained rainfall may be disruptive to activities in the Port and to COMAH establishments.

6.7.2.6 Aircraft & UAS

A 2005 ERM Report[13] for the Department of Transport and the Department of the Environment, Heritage and Local Government identified the Public Safety Zones (PSZ) associated with Dublin Airport based on the calculated individual risk of fatality per annum. The Outer PSZ was defined as the area with an individual risk greater than 10^{-6} per annum. The PSZ was defined for, what was at the time the single existing runway (10R/28L), as well as for the (at the time) proposed northern runway 10L/28R (which opened in August 2022). The PSZ was also defined for the cross runway (16/34). The PSZ for the three runways are shown in **Figure 6-8**.

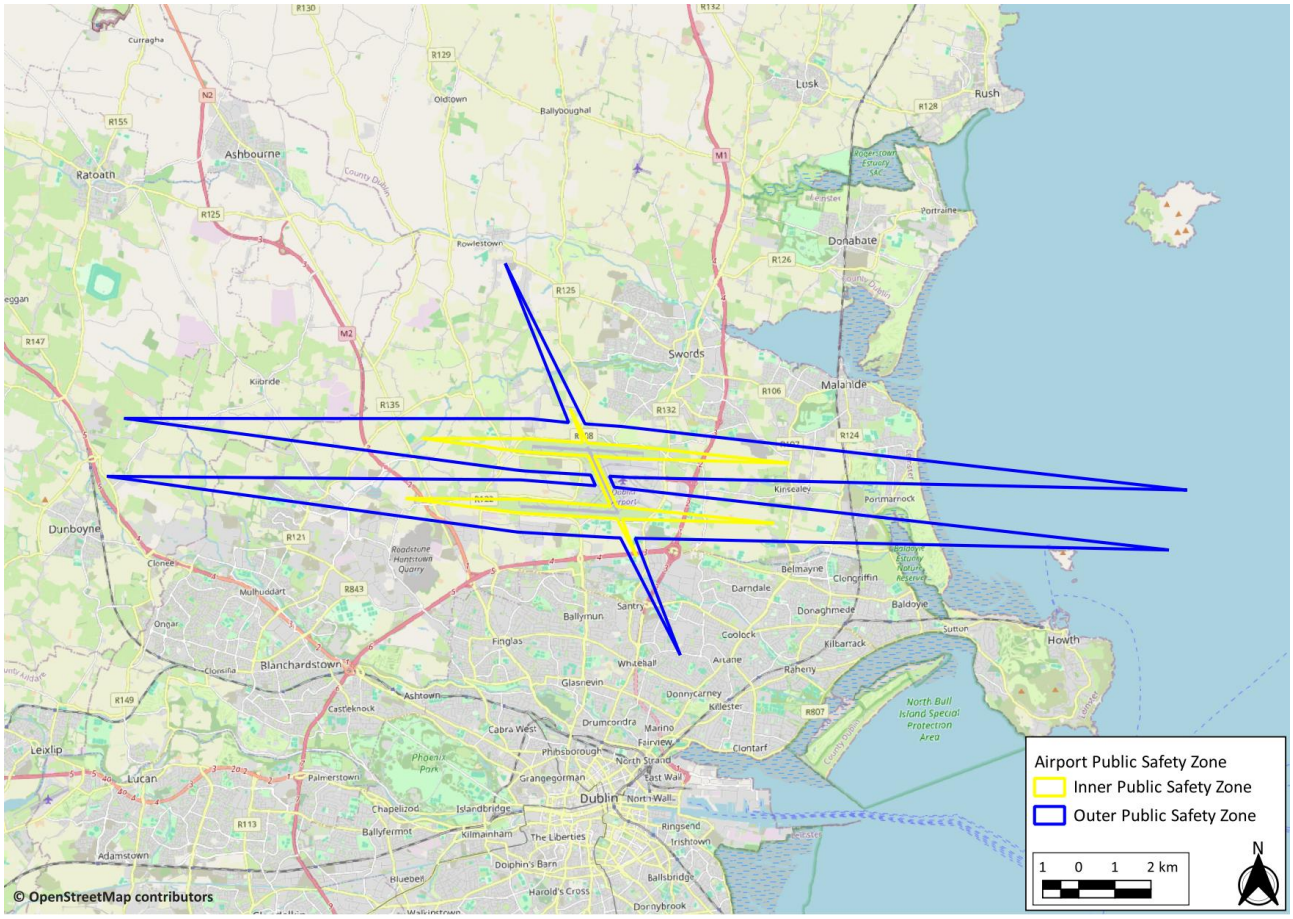


Figure 6-8: Public Safety Zones - Dublin Airport (source: Meath County Development Plan 2020-2026)

As can be seen in **Figure 6-8**, the ABR2 Project is outside the Outer PSZ for all three runways; the PSZ associated with the cross runway 16/34 (oriented southeast-northwest) is approximately 3.9km north of Alexandra Basin.

There is no data available for the probability of aircraft impact at locations in Ireland not in the vicinity of airports (inside the PSZ). The most relevant and up-to-date guidance on background crash rates is from the UK HSE.

[13] Public Safety Zones – Cork, Dublin and Shannon Airports. ERM, February 2005.

Earlier studies include a 2008 review by Atkinson & Thompson[14] and a 2014 study by the Health & Safety Laboratory and Loughborough University[15], which estimated the background crash rate at approximately 3.52×10^{-7} $ha^{-1}y^{-1}$. These have been superseded by a 2015 HSE review of crash rate methodologies, with updated rates published[16] in 2019, using data from 1990 to 2013.

The 2019 updated rates distinguish between airfield-related crash rates and background crash rates applicable at distances greater than 8km from any airfield. The ABR2 Project lies outside the PSZ and is approximately 8km from the closest point of the nearest runway, placing it at the outer boundary of the airfield-related zone as defined by the UK HSE's 2019 guidance. For sites located greater than 8km from an airfield, the background crash rate is the applicable rate, with the rates for different aircraft type shown in **Table 6-11**.

Table 6-11: Calculated background crash rates for Great Britain for the period 1990 to 2013

Aircraft	Mean ($\times 10^{-6}$ km^{-2} y^{-1})	Lower confidence limit ($\times 10^{-6}$ km^{-2} y^{-1})	Upper confidence limit ($\times 10^{-6}$ km^{-2} y^{-1})
Light aircraft	18.5	15.1	22.4
Small transport aircraft	2.2	1.1	3.8
Large transport aircraft	0.7	0.2	1.9
Helicopters	10.3	7.8	13.4
Military combat aircraft	6.7	4.7	9.2
Total	38.4	28.9	50.7

The total background crash rate across all aircraft types is 38.4×10^{-6} km^{-2} y^{-1}. However, since this rate includes military combat aircraft (6.7×10^{-6} km^{-2} y^{-1}), which are not relevant in an Irish context, an adjusted rate of 31.7×10^{-6} km^{-2} y^{-1} is appropriate. Based on the overall area of the ABR2 Project planning boundary (72.6 ha), the overall probability of aircraft impact is approximately 2.3×10^{-5} y^{-1}. However, it is important to note that as the ABR2 Project lies outside the PSZ, the risk of an aircraft crash at any individual point within the project boundary, or within the Port itself, is significantly less than both the PSZ individual risk (10^{-6} y^{-1}) and the overall risk of 2.3×10^{-5} y^{-1} (the latter probability reflects the potential of an aircraft crash *anywhere* within the ABR2 Project footprint rather than at a specific location).

Helicopters may also operate in the vicinity of the Port, or they may overfly the Port. All helicopter pilots must operate in accordance with the Irish Aviation Authority (Standardised Rules of the Air) Order 2019 (S.I. 266/2019), which implements the EU Standardised European Rules of the Air (SERA) in Ireland. Under SERA, a helicopter flying over a congested area – such as Dublin Port – must fly at such a height as would enable it to alight without danger to persons or property on the ground in the event of an engine failure, regardless of whether the helicopter is single- or multi-engine. In practice, this height restriction constrains single-engine helicopter operations over congested areas to a far greater extent than multi-engine helicopters.

[14] Review of Aircraft Crash Rates for the UK up to 2006
[15] A Review and Statistical Modelling of Accidental Aircraft Crashes within Great Britain
[16] Update of Aircraft Crash Rates used by HSE in Assessing Hazards from Chemical, Process and Other Major Hazard Installations (RR1140)

Unmanned aircraft systems (UAS) comprise drones, drone systems, and the equipment used to control and operate a drone. The use of UAS in Ireland is permitted under EU Regulation 2019/945 (which sets out the requirements for unmanned aircraft systems and on third-country operators of unmanned aircraft systems) and EU Regulation 2019 / 947 (which sets out the rules and procedures for the operation of unmanned aircraft). The use of UAS in certain areas is restricted, either restricted airspace or temporary restricted airspace. Dublin Port lies within the Dublin Control Zone (CTR) Amber Zone that extends around Dublin Airport. UAS operating in this zone are restricted to a flight level of 30m above ground level or above the height of the tallest obstacle within 50m. Within this flight level operators are required to comply with the Open Category rules for UAS, which includes keeping the drone in sight at all times.

There is the potential for aircraft, helicopters and UAS to impact on the Port, and on the ABR2 Project, as there is in other areas either in the vicinity of an airport or within flight paths. However, the risk is remote in terms of the likelihood of impact in the case of aircraft / helicopters, and the potential impacts / damage in the case of UAS given that the kinetic energy of a UAS operating under Open Category rules is insufficient to cause a significant event at the Port, though the potential consequences of any impact at a COMAH establishment may be greater than at a non-COMAH facility.

6.7.2.7 Summary

Ireland is an area of relatively low seismic activity and low lightning activity, and in general is not subject to extreme weather events. In light of the nature of the hazards at the COMAH establishments, and the potential major accident scenarios, these natural events do not significantly increase the likelihood of a major accident arising at a COMAH establishment and impacting on the area of the ABR2 Project. The probability data that has been applied in the assessment of the risks associated with the COMAH establishments is from the HSA's 2023 guidance, which the HSA considers to be conservative. In this context, the potential natural and external events that could occur within Dublin Port do not require the application of additional or different probability data.

Similarly, the events outlined in this sub-section do not present a significant risk to the ABR2 Project. Nonetheless, if these events occurred, they could be disruptive to the normal operation within the Port and may require implementation of a relevant mitigation measure (e.g. snow clearance, flood control, adjustment to the normal traffic management).

From a COMAH establishment perspective, the development of the ABR2 Project is not considered to introduce any new risks that could cause or exacerbate a major accident, nor does the ABR2 Project significantly alter the current risks presented to the establishments from normal Port operations. However, an incident or accident at the ABR2 Project, or generally within Dublin Port, could be disruptive to the COMAH establishments depending on the nature and location of the event and, if such an event coincided with a major accident, it may also be disruptive to the emergency response. Accordingly, **Section 6.8** of this Chapter provides a description of Dublin Port's Emergency Response Management Plan.

6.7.3 COMAH Events

6.7.3.1 HSA 2023 Guidance

The HSA's 2023 guidance sets out the types of major accident scenario to be considered as part of a COMAH land use planning assessment for the different types of establishments. The COMAH establishments in the Port can be broadly divided into the following categories:

1. Establishments storing and handling LPG and LNG, namely Calor.
2. Establishments storing and handling one or more petroleum products (or equivalent renewable energy products), namely class I (gasoline), class II (kerosene) or class III (diesel or gas oil) petroleum products. The six oil storage establishments – Circle K, Tedcastles Oil Products, Valero Energy Ireland, Iarnród Éireann, and the two National Oil Reserves Agency facilities – fall within this category. The Synergen Power establishment also falls partly within this category by virtue of the backup store of gas oil; it also falls within category (4) covering generating stations.
3. Establishments storing and handling hazardous waste, including flammable solvents, namely Indaver.
4. Establishments that include significant natural gas infrastructure (aboveground installations), namely Synergen Power. For the reasons set out in **Section 6.4.2.3**, the other four generating stations / generating units within the area of the Port – the ESB Northwall OCGT, the ESB Poolbeg OCGT, the Poolbeg FlexGen, and the Dublin Bay Power / Ringsend FlexGen – have been included in this category, albeit that they are **not** COMAH establishments. These four generating stations units are assessed in parallel with the Synergen Power establishment given the similarity in the hazards and that the HSA's guidance on natural gas infrastructure can be applied directly.

The individual loss of containment scenarios and the resulting end events – the COMAH land use planning scenarios – applicable to each of these four categories of establishment are set out in **Section 6.7.3.2**. For the establishments storing / handling flammable liquids, the HSA's guidance sets out the loss-of-containment and end events based on their ignition category (category 0, 1, 2 or 3). The ignition category is determined using the European Chemicals Agency's *Guidance on the Application of the CLP Criteria*, and is based on a combination of the flash point and the boiling point of the liquid. The criteria, and the corresponding flash points and boiling points of the flammable liquids present at the oil storage establishments, are shown in **Table 6-12**.

Table 6-12: Ignition categories of flammable fluids

		Flash Point	Boiling Point	Category
Category 0		< 0°C	≤ 35°C	-
Category 1		< 23°C	≤ 35°C	-
Category 2		< 23°C	> 35°C	-
Category 3		≥ 23°C and ≤ 60°C	-	-
Gasoline	Circle K	< -40	25 – 210	Category 0
	TOP	-40	31 – 191	

		Flash Point	Boiling Point	Category
	Valero	< 0	30 – 260	
Kerosene	Circle K	> 38	-	Category 3
	TOP	> 38	150 – 290	
	Valero	29 - 70	146 – 299	
Jet A1	Circle K	> 38	140 – 300	Category 3
	TOP	-	–	
	Valero	29 - 70	90 – 320	
Diesel	Circle K	> 55	150 – 390	Category 3
	TOP	> 55	160 – 375	
	Valero	> 56	160 – 400	
Gas oil	Circle K	> 55	150 – 390	Category 3
	TOP	> 55	160 – 375	
	Valero	> 56	160 – 400	
Ethanol		13	78.2	Category 2

6.7.3.2 Scenarios

6.7.3.2.1 LPG and LNG

The scenarios applicable to LPG and LNG installations are set out in Sections 3.1 and 3.2 of the HSA's guidance. For LPG bulk storage tanks, the HSA's guidance considers three loss-of-containment scenarios:

- instantaneous failure
- a continuous leak over 10 minutes during which the entire contents are released
- a leak from a 10mm pipe / connection tank over 30 minutes

These three loss-of-containment scenarios can give rise to several potential end events depending on whether the LPG is ignited immediately on release or if there is a delayed ignition. The end events are a BLEVE (or fireball), a jet fire, a vapour cloud explosion, or a flash fire.

For LNG road transport units, such as the LNG ISO containers that may be present at the Calor establishment, the HSA's guidance considers two loss-of-containment scenarios, namely instantaneous failure and a continuous leak over 10 minutes during which the entire contents are released. These two loss-of-containment scenarios can also give rise to several potential end events depending on whether the material is ignited on release or if there is a delayed ignition. The end events for LNG include fireballs, jet fires and vapour cloud explosions, similar to those for LPG. However, since LNG in the ISO containers is a pressurised cryogenic[17]

[17] Cryogenic liquids are gases that have been cooled to very low temperatures until they condense into a liquid. LNG is typically loaded into LNG ISO containers at approximately -162°C and at atmospheric pressure; over time the temperature of the LNG increases and the LNG is therefore stored as a pressurized cryogenic liquid. Since the temperature of LNG is significantly less than ambient temperature, a release of LNG is unlikely to result in the instantaneous vaporization of the material, thereby resulting in a pool of liquid LNG.

fluid, rather than simply a pressurised liquefied gas, a release of LNG could give rise to a liquid pool which, if ignited, could result in a pool fire.

The LPG and LNG scenarios included in this assessment are shown in **Table 6-13**.

Table 6-13: LPG and LNG scenarios

Substance	LOC scenario	End event	Frequency (per tank-year)	HSA event ref.	Establishment
LPG	Instantaneous failure	BLEVE / fireball	3.50×10^{-7}	001	Calor LPG
		Vapour cloud explosion (VCE)	6.00×10^{-8}	002	
		Flash fire	9.00×10^{-8}	003	
	Continuous leak over 10 minutes	Jet fire	3.50×10^{-7}	004	
		VCE	6.00×10^{-8}	005	
		Flash fire	9.00×10^{-8}	006	
	10mm pipe leak over 30 minutes	Jet fire	7.00×10^{-6}	007	
		VCE	1.20×10^{-6}	008	
		Flash fire	1.80×10^{-6}	009	
LNG	Instantaneous failure	Fireball	2.00×10^{-7}	047	Calor LNG
		VCE	6.00×10^{-8}	048	
		Flash fire	9.00×10^{-8}	049	
		Pool fire	1.50×10^{-7}	050	
	Continuous leak over 10 minutes	Fireball	5.00×10^{-8}	051	
		VCE	9.00×10^{-8}	052	
		Flash fire	1.35×10^{-7}	053	
		Pool fire	2.25×10^{-7}	054	

6.7.3.2.2 Oil Storage

The seven oil storage sites store one or more petroleum or equivalent renewable energy products, namely gasoline, kerosene (including aviation / jet fuel), and diesel / gas oil. Renewable diesel, such as hydrotreated vegetable oil (HVO) has broadly similar physical hazardous properties to diesel, albeit that it may have a different environmental classification to diesel. Therefore, for this assessment, renewable diesel is assessed in the same manner as diesel / gas oil. The Circle K and Valero establishments store ethanol in bulk vertical storage tanks; the TOP establishment stores ethanol in a smaller horizontal storage tank.

Section 3.6.1 of the HSA's guidance sets out three loss-of-containment scenarios for ignition category 0 substances, similar to those for LPG bulk tanks, namely:

- instantaneous failure
- a continuous leak over 10 minutes during which the entire contents are released
- a leak from a 10mm pipe / connection tank over 30 minutes

As in the case of LPG, these three loss-of-containment scenarios can give rise to several potential end events depending on whether and how the substance is ignited. The end events are a pool fire, a vapour cloud explosion, a flash fire, or no fire / explosion event. Certain ignition category 0 substances may be assigned a human health toxicity hazard statement, in which case the end events that do not result in a fire or explosion are assessed for the potential toxic effects. Gasoline is not assigned any acute toxic hazard statements and therefore does not give rise to the potential lethal toxic effects set out in Section 2.5.1 of the HSA's guidance. The potential for an instantaneous failure to result in overtopping of the bund is also taken into account, with the same potential end events – pool fire, VCE or flash fire – applicable to such overtopping events.

In addition to the three general loss-of-containment scenarios and associated end events, gasoline presents a further potential hazard that requires separate consideration. In 2005, an incident occurred at the Buncefield oil depot in Hemel Hempstead, UK, that resulted in a large-scale vapour cloud explosion. This event – a 'Buncefield' type event – is a special case of a vapour cloud explosion that has been subject to investigation into the mechanism that gave rise to the ignition and explosion. The HSA expects that operators of 'Buncefield' type storage facilities implement the recommendations arising from the investigation into the incident, which are designed to prevent such an event occurring. As part of their obligations under the COMAH Regulations, the three establishments that store gasoline[18] – Circle K, TOP, and Valero – are required to demonstrate to the HSA that they have implemented all necessary measures to prevent major accidents occurring and to limit the consequences of any such major accidents for human health and the environment. For this assessment, it is assumed that each establishment implements the relevant recommendations. Nonetheless, the HSA considers that a 'Buncefield' type event should be considered.

The HSA's 2023 guidance does not explicitly set out the approach for assessing a 'Buncefield' type event, but rather advises that the magnitude of the overpressure generated by a vapour cloud explosion (VCE) can be based on a stoichiometric burning ratio of the vapourised liquid, by default with an ignition strength of 7 for 20% of the volume and a combustion energy of 3.5MJ/m³, using the TNO multi-energy model[19]. This is broadly consistent with the UK HSE guidance[20] arising from the Buncefield incident, albeit that it is considered to be very conservative. However, while the HSA advises on the *ignition* characteristics of a vapour cloud, it does not provide guidance on estimating the volume of vapour that could arise. The UK HSE's guidance advises that rather than model a specific release scenario, the following approach can be adopted:

- The VCE event could be centred anywhere on site (for practical purposes, the frequency can be uniformly distributed between the locations close to all the main fuel storage tanks).

[18] The requirement to demonstrate to the HSA that all necessary measures to prevent major accidents occurring and to limit the consequences have been implemented applies to *all* COMAH establishments; establishments that store gasoline are required to demonstrate that they implement the specific measures related to 'Buncefield' type events.
[19] The TNO Multi-Energy Model (MEM) is a widely used engineering method in process safety and industrial risk assessment for predicting the blast effects of vapour cloud explosions. It was developed by the Netherlands Organisation for Applied Scientific Research (Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, abbreviated to TNO).
[20] RR512 Review of significance of societal risk for proposed revision to land use planning arrangements for large scale petroleum storage sites.

- The magnitude of the overpressure generated by the VCE is defined as that arising from a 50,000m³ VCE with an ignition strength of 7 and a combustion energy of 3.5MJ/m³ using the TNO multi-energy method (the same *ignition* characteristics as set out in the HSA's guidance). These assumptions are broadly consistent with the observed damage at Buncefield.

The overpressures arising from a 50,000m³ vapour cloud are set out in the UK HSE Research Report RR512[20], as shown in **Table 6-14**.

Table 6-14: Overpressures from 'Buncefield' type VCE

Distance (m)	Overpressure (mbar)
Near field (up to ~ 50 m)	1,000
97	600
264	140
447	70
2,000	13

The loss-of-contain scenarios for ignition category 2 (ethanol) and ignition category 3 substances are the same as for ignition category 0, namely instantaneous failure, a continuous leak over 10 minutes during which the entire contents are released, and a leak from a 10mm pipe / connection tank over 30 minutes. However, for ignition category 2 substances only pool fires within the bund, and potential pool fires following overtopping, are considered credible, and for ignition category 3 substances only bund overtopping events that give rise to pools outside an establishment are considered credible.

The scenarios for ignition category 0, 2 and 3 substances in this assessment are shown in **Table 6-15**.

Table 6-15: Ignition category 0, 2 and 3 substance scenarios

Substance	LOC scenario	End event	Frequency (per tank-year)	HSA event ref.	Establishment
Ignition category 0	Instantaneous failure	Pool fire	9.96×10^{-7}	091	Circle K Yard 2 Circle K Yard 4 TOP Yard 1 TOP Yard 2 Valero North
		VCE	1.82×10^{-6}	092	
		Flash fire	5.46×10^{-7}	093	
		None	1.64×10^{-6}	094	
	Continuous leak over 10 minutes	Pool fire	9.96×10^{-7}	095	
		VCE	1.82×10^{-6}	096	
		Flash fire	5.46×10^{-7}	097	
		None	1.64×10^{-6}	098	
	10mm pipe leak over 30 minutes	Pool fire	1.99×10^{-5}	099	
		VCE	3.64×10^{-5}	100	
		Flash fire	1.09×10^{-5}	101	
		None	3.28×10^{-5}	102	
		Pool fire	9.96×10^{-7}	103	

Substance	LOC scenario	End event	Frequency (per tank-year)	HSA event ref.	Establishment
	Instantaneous failure - overtop	VCE	1.82×10^{-6}	104	
		Flash fire	5.46×10^{-7}	105	
		None	1.64×10^{-6}	106	
	Buncefield-type event	VCE	1.00×10^{-6}	Section 3.6.1	
Ignition category 2	Instantaneous failure	Pool fire	5.00×10^{-8}	123	Circle K Yard 2 Valero North
		None	4.95×10^{-6}	124	
	Continuous leak over 10 minutes	Pool fire	5.00×10^{-8}	125	
		None	4.95×10^{-6}	126	
	10mm pipe leak over 30 minutes	Pool fire	1.00×10^{-6}	127	
		None	9.90×10^{-5}	128	
	Instantaneous failure - overtop	Pool fire	5.00×10^{-8}	No ref.	
		None	4.95×10^{-6}	No ref.	
Ignition category 3	Instantaneous failure - overtop	Pool fire	5.00×10^{-8}	No ref.	Circle K Yard 1 Circle K Yard 2 Circle K Yard 3 Circle K Yard 4 TOP Yard 1 TOP Yard 2 Valero South Iarnród Éireann Synergen NORA Ringsend NORA Poolbeg
		None	4.95×10^{-6}	No ref.	

6.7.3.2.3 Hazardous Waste

There are two scenarios relevant to the Indaver hazardous waste facility, one associated with the bulk waste solvent tanks, and one associated with the hazardous waste drum store.

- There are three bulk tanks that hold waste solvent, two in one bund and one larger tank in a second bund. All three tanks are double skinned tanks, and therefore the bunds serve as tertiary, rather than secondary containment, thereby eliminating the potential bund overtopping scenario. The loss-of-containment scenarios and end events are similar to those set out for ignition category 2 flammable liquids in **Table 6-15**.
- The drum store, to the west of the site, can be conservatively characterised under the HSA's COMAH land use planning guidance as a dangerous substances warehouse.

The scenarios for the hazardous waste facility in this assessment are shown in **Table 6-16**.

Table 6-16: Hazardous waste facility scenarios

Substance	LOC scenario	End event	Frequency (per tank- or area-year)	HSA event ref.	Establishment
Ignition category 2	Instantaneous failure	Pool fire	5.00×10^{-8}	123	Indaver
		None	4.95×10^{-6}	124	
	Continuous leak over 10 minutes	Pool fire	5.00×10^{-8}	125	
		None	4.95×10^{-6}	126	
	10 mm pipe leak over 30 minutes	Pool fire	1.00×10^{-6}	127	
		None	9.90×10^{-5}	128	
	Instantaneous failure - overtop	Pool fire	5.00×10^{-8}	No ref.	
		None	4.95×10^{-6}	No ref.	
Dangerous substance warehouse (drum store)	Fire – 10% of inventory	Fire	1.00×10^{-3}	167	
	Fire – 100 % of inventory	Fire	1.00×10^{-4}	168	

6.7.3.2.4 Generating Stations (Natural Gas Infrastructure)

The loss-of-containment scenarios and corresponding end events for natural gas infrastructure applicable to the generating stations / generating units are described in Section 3.5 of the HSA's guidance. The loss-of-containment scenarios are applicable to aboveground and underground pipelines and similar to the loss-of-containment scenarios for LPG, LNG and flammable liquids, they consider both a rupture of a pipeline and leak from a pipeline. The corresponding end events are also similar to the LPG events, namely a fireball or jet fire, a flash fire, and a vapour cloud explosion (VCE).

The scenarios for the generating stations / generating units in this assessment are shown in **Table 6-17**.

Table 6-17: Generating stations scenarios

Substance	LOC scenario	End event	Frequency (per tank- or area-year)	HSA event ref.	Establishment
Natural gas	Aboveground pipeline rupture	Fireball/jet fire	1.00×10^{-8}	087 & Table 42	ESB Northwall ESB Poolbeg Poolbeg FlexGen Synergen / Dublin Bay Power Dublin Bay Power FlexGen
		Flash fire	3.60×10^{-8}	087 & Table 42	
		VCE	5.40×10^{-8}	087 & Table 42	
	Aboveground pipeline leak	Fireball/jet fire	5.00×10^{-8}	088 & Table 42	
		Flash fire	1.80×10^{-7}	088 & Table 42	
		VCE	2.70×10^{-7}	088 & Table 42	
	Underground pipeline rupture	Fireball/jet fire	1.00×10^{-9}	089 & Table 42	
		Flash fire	3.60×10^{-9}	089 & Table 42	
		VCE	5.40×10^{-9}	089 & Table 42	
	Underground pipeline leak	Fireball/jet fire	5.00×10^{-9}	090 & Table 42	
		Flash fire	1.80×10^{-8}	090 & Table 42	

Substance	LOC scenario	End event	Frequency (per tank- or area-year)	HSA event ref.	Establishment
		VCE	2.70×10^{-8}	090 & Table 42	

6.7.3.2.5 Bund Overtopping

The potential for material that is released from a tank in the event of an instantaneous tank failure to overtop the secondary containment (bund) is a credible event, albeit remote. As set out in the HSA's guidance, the potential ignition of a flammable substance is dependent, to varying degrees, on whether the material is contained within the bund, or if it overtops a bund whether the material is retained within the boundary of the COMAH establishment or migrates beyond the COMAH establishment boundary. While the same principle applies to the COMAH establishments within the Port, the layout of the COMAH establishments and individual bunds means that potential overtopping events may overtop into other bunds within the same establishment, or may overtop into other COMAH establishments or into specific bunds in other COMAH establishments. Since all COMAH establishments implement controls on ignition sources, and that the COMAH establishments within the Port manage the same types of risk as their neighbouring COMAH establishments, it is reasonable to consider that equivalent levels of ignition control exist between the different sites. Therefore, for this assessment, if material overtops a bund onto another COMAH establishment, it is assumed that the potential ignition of the substance is equivalent to that material being retained at the source site.

6.7.3.3 Individual Risk

The aggregated risk contours for the inner, middle, and outer zones around the COMAH establishments are shown in **Figure 6-9** and in **Appendix 6-6**.

The risk contours show that there are three distinct zones: a larger zone extending over the northern part of the Port encompassing the six COMAH establishments, and two smaller zones in the southern part of the Port, one nominally centred on the ESB Poolbeg generating station / NORA Poolbeg establishment, and one nominally centred on the Dublin Bay Power generating station / NORA Ringsend establishment.

The individual risk contours extend primarily over the land-side of the northern part of the Port, with only the outer (green) individual risk zone extending into the river channel; the outer zone at the eastern end of the southern part of the Port also extends marginally into the river channel. Overall, the outer zone extends over parts of the ABR2 Project boundary, primarily at the working area to the east beside the infill area for the basin of Berths 52/53. This working area falls within the scope of either Development Sensitivity Level 1 for a workplace with fewer than 100 persons, or Development Sensitivity Level 2 for a workplace with more than 100 persons. In either case, the working area is compatible with the HSA's matrix for land use planning advice shown in **Table 6-7**.

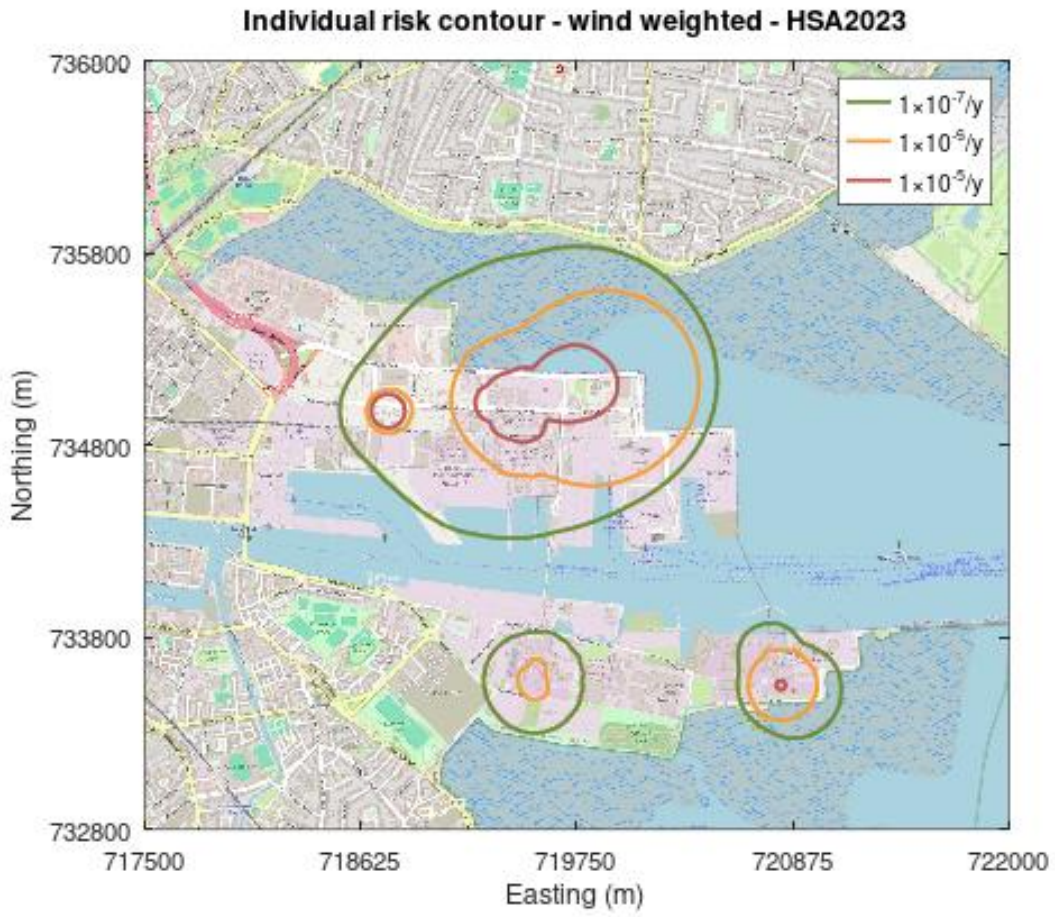


Figure 6-9: Individual risk contours

6.7.3.4 Societal Risk

6.7.3.4.1 Expectation Value

The ABR2 Project does not entail any specific changes to the population within Dublin Port, and does not introduce any new COMAH hazards, and therefore there is no change in the overall societal risk associated with the development, other than for the duration of the construction phase of the project; the changes in population associated with the construction of the Unified Passenger Terminal have been assessed under the MP2 Project.

Therefore, for the societal risk assessment, the expectation value has been estimated based on a conservative estimate of the number of workers in the area of the ABR2 Project (nominally the working area shown in **Figure 6-1**) during the construction stage of the ABR2 Project. The estimated EV associated with the (temporary) working population is estimated as approximately 110, based on an average individual risk in the working area of 1.07×10^{-7} (0.107CPM – chances per million). This EV is substantially less than the HSA's upper limit of 10,000 for an EV. While it is also less than an EV of 450 – the level at which the HSA requires an FN curve – given the relatively large footprint of the ABR2 Project, the Dublin Port estate, and the extent of the individual risk contours associated with the COMAH establishments, an FN curve has been estimated in **Section 6.7.3.4.2**.

6.7.3.4.2 FN Curves

The FN curve associated with the COMAH establishments and the non-COMAH generating stations in the north and south of the Port is shown in **Figure 6-10**, taking into account the estimated population of the Port and the surrounding area as described in **Section 6.5.2**.

Figure 6-10 shows that a small section of the curve lies marginally above the upper 'tolerability' line. However, as noted in **Section 6.6.2.3.2**, while FN curves are useful for assessing societal risk for individual COMAH establishments, and in principle for assessing wider societal risk, it is recognised that there is a degree of uncertainty associated with the determination of societal risks, and therefore it is also accepted that societal risk criteria (in the form of FN lines) should be regarded as no more than indicators or guidelines. As noted in the HSA's guidance, the loss-of-containment events and the associated probability data are intended to provide a conservative estimate of the risk associated with a COMAH establishment, and therefore it is reasonable to consider that the overall assessment of the societal risk (and the individual risk) is conservative.

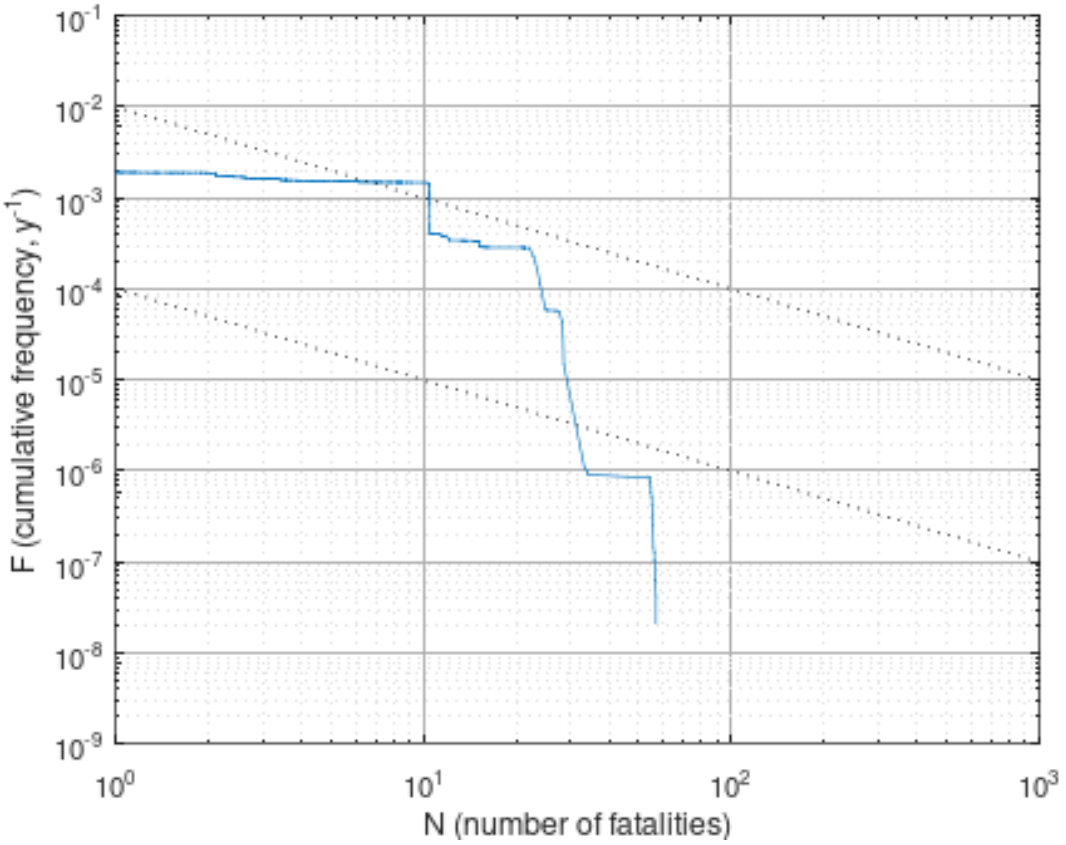


Figure 6-10: FN curve for Dublin Port

6.7.4 Non-COMAH Events

6.7.4.1 Transport of dangerous goods by road

The substances that are stored and handled at the COMAH establishments are also transported to and from the establishments by road. On the north side of the Port (closest to the ABR2 Project) these include:

- LPG is loaded into road tankers at the Calor establishment for distribution to customers, with the road tankers making use of certain roads within the Port to get from the COMAH establishment to the main road network (outside the Port).
- LNG ISO containers are delivered to the Calor establishment by road (offloaded from vessels at the Port), and are distributed from the Calor establishment via the Dublin Port road network; the LNG is neither removed from or added to the ISO containers at the Calor establishment – the ISO containers are sealed units in transit, which limits the loss-of-containment scenarios compared to a fixed installation.
- Petroleum products are loaded into road tankers at the respective sites for distribution to customers, with the road tankers making use of the Dublin Port road network.
- The Indaver establishment is a waste transfer station and therefore waste materials are transported to the site in light and heavy goods vehicles, including in road tankers for bulk waste solvents. The materials are sorted and segregated at the site and are subsequently dispatched from the site in light and heavy goods vehicles for export or transfer to another waste facility.

Petroleum products are loaded at the following locations on the north side of the Port:

- Circle K Terminal opposite Tedcastles Oil Products Yard 1 on No. 2 Branch Road North Extension

  Empty road tankers enter the Terminal from No. 2 Branch Road North Extension and exit onto Promenade Road (to the north of the Terminal). The tankers then follow the one-way system along Promenade Road before exiting the Port along Tolka Quay Road. The Circle K Terminal serves Circle K Yard 1, Yard 2, Yard 3 and certain petroleum products from Yard 4. Class I, II and III petroleum products, and renewable energy products, are loaded at the Circle K Terminal.
- Circle K Yard 4 on Alexandra Road

  Empty road tankers enter the site from Alexandra Road to the east of the main building (and west of the two southern-most bulk tanks), are loaded at the gantry, and exit onto Alexandra Road on the western side of the main building. The tankers can either exit the Port along Alexandra Road onto East Wall Road (heading west), or via 1 Branch Road North, Tolka Quay Road and Link Road exiting the Port at the main Port exit / entry on Promenade Road. Class II petroleum products are loaded at Circle K Yard 4.
- Iarnród Éireann establishment on Alexandra Road

  Road tankers enter and exit the site via Alexandra Road. Loaded tankers exit the Port via No. 2 Branch Road North, onto Tolka Quay Road and ultimately exiting the Port along Promenade Road. Class III petroleum products are loaded at Iarnród Éireann.
- Tedcastles Oil Products Yard 1 on No. 2 Branch Road North Extension (opposite the entrance to the Circle K Terminal.

  Road tankers enter and exit Yard 1 via No. 2 Branch Road North Extension. Due to the configuration of the Dublin Port road network, loaded tankers turn left onto Tolka Quay Road (heading east) before

turning through 180° at the roundabout junction between Tolka Quay Road and Breakwater Road. Road tankers then exit the Port via Tolka Quay Road, Link Road and Promenade Road. Class I, II and III petroleum products (and renewable energy products) are loaded at TOP Yard 1, with the loading facility serving both TOP Yard 1 and TOP Yard 2.

- The southern part of the Valero establishment on Alexandra Road

  Road tankers enter and exit the southern part of the Valero establishment via Alexandra Road, with loaded tankers exiting the site onto Alexandra Road, exiting the Port via either Breakwater Road or No. 2 Branch Road North onto Tolka Quay Road, ultimately exiting the Port along Promenade Road. Class I, II and III petroleum products (and renewable energy products) are loaded at the loading gantry on the southern part of Valero, with the loading facility serving both the northern and southern parts of the establishment.

The loading facility at Circle K Yard 4 is the closest facility to the ABR2 Project, approximately 240 m to the north, with road tankers entering (empty) and exiting (loaded) Yard 4 coming closest to the ABR2 Project. The LPG loading facility at the Calor establishment, and the loaded LPG road tankers and the LNG ISO containers dispatched from the Calor establishment, are the closest dangerous substance road transport units to the eastern part of the ABR2 Project (approximately 300 m at the closest point).

A variety of dangerous substances are also transported through the south side of the Port estate including:

- waste delivery trucks bringing waste to the Covanta Waste-to-Energy facility
- cement leaving the Ecocem production facility
- chemical deliveries to Ringsend wastewater treatment plant

In addition, substances that are stored and handled at the COMAH establishments are also transported to and/or from the establishments by road, albeit infrequently. The two NORA establishments are strategic oil storage terminals and, in general, movement of petroleum products in and out of these terminals is very infrequent. During emergency releases, petroleum products may be loaded into road tankers at the respective sites for distribution, with the road tankers making use of certain roads within the Port to get from the COMAH establishment to the main road network (outside Dublin Port). Petroleum products may be loaded on the southern part of the NORA Poolbeg establishment and the south-east part of the NORA Poolbeg establishment. In general, vehicles exit the sites onto Pigeon House Road, onto Whitebank Road, ultimately exiting the port along South Bank Road.

All vehicles conveying dangerous substances by road are subject to the European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR). The ADR sets out the requirements for packing, loading, filling, transporting and unloading dangerous goods, and the requirements for the performance of the containers, the segregation / separation of incompatible materials, the separation of dangerous goods from other goods, and the actions to be taken in the event of an emergency. In addition, dangerous substances within the Port estate are governed by the Dublin Port Bye-Laws - Dangerous Goods (Cargoes).

Specialised vehicles that convey dangerous substances, such as road tankers (for petroleum products, LPG and LNG), must be certified for the transport of dangerous goods on an annual basis. Therefore, in addition to

holding a Commercial Vehicle Road Test certificate (either as a heavy or light commercial vehicle), these vehicles must also hold an ADR vehicle certificate. Drivers of vehicles conveying dangerous goods must hold a valid ADR Training Certificate, which requires completion of an approved basic and / or tanker specialisation driver training course and successful completion of an exam, which, in Ireland, is managed by the Chartered Institute of Logistics and Transport.

If a vehicle transporting a dangerous substance were involved in an incident giving rise to a major accident, the consequences would be similar in nature to those described for the COMAH establishments (e.g. an explosion, fire or release of potentially toxic material), albeit that the quantities involved in the incident would generally be smaller.

The traffic routes that dangerous goods vehicles use within the north side of the Port generally coincide with the areas of the Port that may be impacted by events at the individual COMAH establishments, including unbunded pool fires. The traffic routes for vehicles conveying dangerous goods also coincide, in part, with the routes used by other traffic within the Port, including traffic to and from the ferry terminals at the east end of the estate in the area of the ABR2 Project (the working area at ferry Terminal 1 and Terminal 5). As the same traffic will continue to access the east end of the Port following the ABR2 Project, there is no change in the risk to which such vehicles and occupants are exposed from the transport of dangerous goods by road.

6.7.4.2 Transport of dangerous substances by sea

The ABR2 Project primarily involves works on the water-side of the Port – dredging in Alexandra Basin West and infilling the existing Terminal 5 basin to accommodate the construction of the Unified Ferry Terminal and the relocation of Berths 52/53 under the MP2 Project – with the land-side elements of the project primarily serving as working areas. Given that the majority of the Project involves works in the river channel and Alexandra Basin West, it is prudent to consider the potential interactions between the ABR2 Project works and vessels accessing the Port, in particular vessels conveying dangerous substances.

Dangerous goods conveyed by ship (either in containers or in trucks / tankers on ferries) are subject to The International Maritime Dangerous Goods (IMDG) Code. As in the case of the ADR, the IMDG sets out the requirements for packing, loading, filling, transporting and unloading dangerous goods, and the requirements for the performance of the containers, the segregation / separation of incompatible materials, the separation of dangerous goods from other goods and, in the case of the IMDG, separation from passenger spaces, and the actions to be taken in the event of an emergency

Petroleum and renewable energy products are shipped to Dublin Port in bulk tankers, offloading product at the oil berths on the north side of the river, immediately to the south of the southern part of the Valero establishment. There are four oil berths – Oil Berth No. 1 to 4 – and while all four are capable of serving oil tankers, Berth No. 1 and No. 2 (to the west) are the primary berths. Oil Berth No. 3, to the east, is the primary berth for offloading LPG to the Calor establishment.

During 2025, 444 vessels were berthed at Oil Berth No. 1 to 4, with the majority berthed at Oil Berth No. 1 (186) and Oil Berth No. 2 (168), approximately 20% berthed at Oil Berth No. 3 (81), and only 9 vessels berthed at Oil Berth No. 4. Overall, Oil Berth No. 1 and No. 2 were occupied for approximately 50% of the time, Oil

Berth No. 3 was occupied for approximately 25% of the time, and Oil Berth No. 4 was occupied for approximately 3% of the time. The majority of vessels at these four berths were oil or LPG tankers, with other vessels occasionally at the berths depending on the operational requirements of the Port (for example, awaiting a cargo / container berth).

The four oil berths are outside the area of the ABR2 Project, but vessels accessing the berths will sail past the infill area at the Terminal 5 basin and will be within the overall boundary of the ABR2 Project (which extends along the width of the river channel as far as Alexandra Basin West). Other vessels – including cargo vessels, container vessels, car-carriers, bulk carriers – will also navigate the main channel past the Terminal 5 basin and up to and beyond Alexandra Basin West, and while these vessels do not present the same risk as oil or LPG tankers, there is the potential for interaction between the vessels and the works under the ABR2 Project.

Certain container vessels carry packaged dangerous goods (in containers and smaller packages), and therefore a vessel coming into direct contact with the ABR2 Project works could, in principle, give rise to a loss of containment of dangerous goods. However, the transport of packaged (and any) dangerous goods are subject to the IMDG Code requirements for segregation and containment, and the quantities of any individual dangerous goods in a single container are limited compared to the bulk quantities transported in oil or LPG tankers or stored at the COMAH establishments. The consequences of any such incident would therefore be significantly less severe than those associated with the COMAH establishments.

The navigation of vessels within Dublin Port is managed by Dublin Port Company under the Dublin Port Bye-Laws and the Dublin Port Notices to Mariners, with all vessels required to operate under pilotage within the port limits. The use of marine pilots and the requirements for tug assistance for larger vessels provide a significant layer of control over vessel movements within the Port, reducing the likelihood of an uncontrolled vessel interaction with the ABR2 Project works. During the construction phase, the works areas will be marked by appropriate navigational aids, further reducing the risk of vessel interaction with the works.

Overall, while the potential for interaction between vessels conveying dangerous substances and the ABR2 Project works cannot be entirely excluded, the regulatory controls governing vessel movements within the Port, the requirements of the IMDG Code, and the navigational controls in place during the construction phase combine to reduce the risk to an acceptable level.

6.7.4.3 Transport of dangerous substances by pipeline

The Common Oil Pipeline (COP) on the north side of the Port is used for transferring petroleum and renewable energy products from the oil berths to the various oil storage sites on the north side of the Port, and for transferring LPG to the Calor establishment. The COP comprises separate pipelines for different products, including LPG, gasoline, kerosene, gas oil and bitumen (to three facilities that store bitumen and that are not subject to the COMAH Regulations). The pipelines generally run above-ground, with short sections running under certain road junctions and in culverts, or over pipebridges (primarily along Alexandra Road connecting the two parts of the Valero establishment). The COP extends from Jetty Road to the north of the jetties, from where it takes one of two routes:

- To the west along Jetty Road, along the southern boundaries of the Valero, Irish Tar & Bitumen, and Iarnród Éireann sites onto No. 4 Branch Road South, and then north along No. 4 Branch Road South and No. 2 Branch Road North. At the junction with Tolka Quay Road, this part of the COP splits into three:
  - west along the south side of Tolka Quay Road,
  - north along No. 2 Branch Road North Extension,
  - east along the south side of Tolka Quay Road, and
- To the east along Jetty Road, before turning north along the western side of Breakwater Road South. At the junction with Tolka Quay Road, this part of the COP splits into two:
  - west along the south side of Tolka Quay Road, and
  - east along the south side of Tolka Quay Road (serving the Calor establishment).

The individual pipelines are between 6 inches and 10 inches (150mm to 250mm) in diameter. They are conveyed on dedicated pipeline supports and are separated (and protected) from the roadways by concrete or metal barriers. Petroleum products are transferred through the pipelines at flow rates of between 140 and 460 tonnes per hour. In the event of a loss of containment from a pipeline, due to an external impact (e.g. significant traffic incident or civil / construction works in the vicinity of a pipeline) or failure of a pipeline, up to 140 tonnes could be released, based on a conservative 20-minute response time to shut down the pumps. Depending on the location of such a failure, the product could spill onto the road and if ignited would result in an unbunded pool fire similar to those described for the individual COMAH establishments.

As in the case of the transport of dangerous goods by road, the route for the COP on the north side of the Port coincides, in part, with the routes used by traffic in the Port, including traffic to and from the terminals at the east end of the estate in the area of the ABR2 Project. As the same traffic will continue to access the east end of the Port following the ABR2 Project, there is no change in the risk to which such vehicles and occupants are exposed from the COP.

On the south side of the Port there is a system of pipelines for transferring petroleum products from the oil berths – either ESB Jetty 48 or Deep Water Berth 46 – to the various oil storage sites (the two NORA establishments and Dublin Bay Power). The oil distribution pipelines in Dublin Port south consist of two main routes:

- From the ESB jetty (Berth 48) into the northern part of the NORA Poolbeg establishment. This jetty will be relocated further east as part of the proposed 3FM Project under a separate planning application.
- From Deep Water Berth 46 along the north and western boundary of the Dublin Bay Power bulk storage tanks, crossing beneath Pigeon House Road and continuing along the western boundary of the NORA Ringsend establishment.

As in the case of the northern part of the Port, the pipeline routes generally coincide with the areas of the Port that may be impacted by events at the individual COMAH establishments, including in particular unbunded pool fires.

None of the oil pipelines on the north or south sides of the Port lie within the ABR2 Project boundary and no works on or modifications to the pipelines are proposed under the project. The main risk to the ABR2 Project associated with the pipelines, and the risk to the pipelines from the ABR2 Project itself, is from traffic activity primarily along Tolka Quay Road (the main access / egress road in the Port where the COP is present). These risks – from and to the COP – are the same risks associated with the existing traffic movements in the Port and the existing operation of the pipelines. Both traffic movements and the operation of the COP are carefully managed by Dublin Port Company and the individual operators of the establishments that make use of the pipelines.

6.7.4.4 Natural Gas Pipelines

There are several high-pressure gas transmission pipelines in the Port on both the north side and the south side, generally serving the generating stations. On the north side of the Port the gas transmission line enters the Port from East Wall Road and runs east along Promenade Road to No. 2 Branch Road North, south along No. 2 Branch Road North across Tolka Quay Road to Alexandra Road, and west along Alexandra Road to the ESB Northwall generating station. The pipeline runs underground for the entire length, coming above ground at the AGI at the generating station. The closest part of the gas transmission pipeline to the ABR2 Project is at the ESB Northwall generating station, approximately 330m to the northeast of Alexandra Basin West.

The gas transmission network also extends across the southern part of the Port, serving the ESB Dublin Bay Power OCGT, the Dublin Bay Power FlexGen, the ESB Poolbeg OCGT, and the Poolbeg FlexGen generating units. The transmission pipeline runs underground along South Bank Road, to the south of the ESB Dublin Bay Power and Dublin Bay Power FlexGen sites, to the south of the Ringsend waste water treatment plant, and through the northern part of the Irishtown Nature Park before running along Pigeon House Road to supply the ESB Poolbeg and FlexGen AGI. The closest part of the high-pressure gas transmission network on the south side of the Port to the ABR2 Project boundary is on Pigeon House Road immediately opposite Alexandra Basin West, at a distance of approximately 100m. However, this part of the high-pressure gas transmission network is underground; the closest aboveground part of the network is at the ESB Dublin Bay Power AGI (approximately 380m).

The risks associated with the AGI at the five generating stations / units have been assessed as part of the individual risk assessment for the COMAH establishments. This assessment concluded that the majority of the ABR2 Project lies outside the individual risk contours, and that the parts of the ABR2 Project lying inside the contours are compatible with the HSA's guidance on development sensitivity levels.

6.8 Emergency Response Management

6.8.1 Introduction

Dublin Port's approach to Emergency Response Management is described in the following sub-sections, in the context of the potential for major accident hazards to arise at the COMAH establishments and, more generally, for other incidents and accidents that may arise across the Port estate.

6.8.2 Dublin Port Security

DPC operates its own Port Security, which is present on the Port Estate 24 hours a day, seven days a week, 365 days a year. Two patrol vehicles operate at all times in conjunction with An Garda Síochána, and Dublin Port has a close working relationship with DCC, the operator of the Dublin Port Tunnel, and TII. In addition, DPC has a comprehensive CCTV system across the estate, with over 130 camera locations monitoring the road network and port infrastructure, with the system monitored by Port Security at all times. Therefore, in the event of an incident on the road network, or an incident at a COMAH (or other facility) within the port requiring the diversion of traffic, DPC can respond immediately and co-ordinate directly with the relevant emergency services.

6.8.3 Dublin Port Emergency Management Plan

6.8.3.1 Summary

As set out in "A Framework For Major Emergency Management" (produced by the National Steering Committee for Major Emergency Management), the Harbours Act places responsibility on the Harbour Master for the safety of shipping and all activities within the defined port limits. The legislation also requires that emergency plans be prepared in respect of the major ports. These emergency plans are designed generally to deal with incidents, in the first place using the port's own resources. Each port is also required to prepare an oil pollution plan to deal with oil pollution incidents, and responsibility for implementing the plan rests with the harbour master. Where COMAH establishments are located within a port (or harbour), the port authority is designated as a local competent authority and as such is included in the relevant external emergency planning process.

In this context, DPC has developed its Emergency Management Plan, the aim of which is to set out the structures and arrangements that will be used in response to an emergency to mitigate:

- loss of life or injury to employees, contractors, visitors and local residents,
- damage to the environment, and
- damage to the facilities, plant and equipment within the port, its commercial partners, tenant companies and neighbours.

The plan also aims to ensure that DPC emergency management structures and arrangements are compatible with the requirements of the Framework for Major Emergency Management.

The actions to be taken in an emergency are decided by the Emergency Management Team (EMT) and the plan itself may be activated by the Chief Executive Office, the Emergency Management Marine Coordinator (EMMC), or the Emergency Management Land Coordinator (EMLC), depending on the circumstances and severity of the incident. The plan is designed to cater for both marine and land-based emergencies. The Dublin Port Emergency Management Plan also contains several scenario-specific sub plans for the individual types of emergency scenario, which focus on the immediate actions to be taken by internal sections of the Port Company.

6.8.3.2 Dublin Port Alarm

The DPC fire alarm panel system is located in the Port Security Control Room, situated on the ground floor of the Port Operations Centre. The fire alarm system monitors approximately 21 sites, and break glass units are located throughout the port estate.

The fire alarm system can be activated manually or automatically from various points around the Port directly linked to the system. When activated, Port Security are immediately alerted and investigate the alarm before deciding on what action is required. The port wide sirens are located at the ESB North Wall Generating Station, the oil jetties, and DP Warehousing. With the exception of alarm tests, all pumping stops immediately on sounding of the Port-wide siren. Fire Wardens on the oil jetties communicate with all users of the Dublin Port COP by VHF radio.

For confirmed alarm activations, the affected site and Port Security request the attendance of the emergency services, advising them of the nature of the emergency, name and location of the site affected using the ETHANE pneumonic:

- Exact location of the emergency.
- Type of emergency (e.g. fire; hazardous material spill; road traffic accident).
- Hazards (present and potential).
- Access route to the emergency.
- Number and type of casualties (if known).
- Emergency Services (those present and those required).

Once confirmed, Port Security open the emergency gates at the western end junction of Tolka Quay Road and East Wall Road, and this area operates as the emergency services rendezvous point. Dublin Fire Brigade will be dispatched to the Port to respond to the incident, while Port Security will implement a traffic control plan, with the support of An Garda Síochána, as required.

The Port-wide alarm system is a continuous wailing alarm sound. On hearing this alarm, port users should:

- Be aware that an incident is ongoing.
- Account for staff, visitors and contractors.

- Continue to operate as normal unless instructed otherwise, or individual company standard operating procedures indicate otherwise.
- Wait for further instructions from the Harbour Police & Port Security or the Principal Emergency Services.

Port users should await further information from Port Security, while members of the public should tune in to a national radio station for updates.

6.8.3.3 Port Evacuation

During an emergency it may be necessary to evacuate the Port, or parts of the Port. As set out in the Dublin Port Company Emergency Management Plan, Port Security controls traffic flow throughout the port in the event of an evacuation of one or more areas.

6.8.4 Dublin City Council Major Emergency Plan

Dublin City Council, the relevant Garda Division and Health Service Executive District are the Principal Response Agencies (PRAs) charged with managing the response to emergency situations that arise within Dublin City Council's administrative boundary. The Dublin City Council Major Emergency Plan (2022) is supported by, and is compatible with, the major emergency plans of An Garda Síochána and the Health Service Executive. In certain circumstances, the local response may be escalated to regional level, thus activating the plan for regional level co-ordination. If this is activated, the management of the incident is coordinated from a regional perspective.

Several specific local plans, such as the response plan to flood emergencies, remain in place as standalone plans, which can be implemented under the general arrangements and structures set out in the plan. Certain types of emergency have a particular focus, thus enabling a hazard or site-specific plan to be activated. Sub-plans deal with a range of incidents, such as severe weather emergencies, large crowd events and hazardous substances storage sites (such as COMAH establishments).

In the Dublin City Council administrative area, interagency specific off-site plans have been prepared for the upper tier establishments notified to the HSA (including those within the Port). In addition, the Port has prepared emergency plans and maintains emergency services commensurate with the hazards within the Port boundary. Dublin Port generally requests the attendance of the principal emergency services at alerts, incidents and exercises at the facility. Where appropriate, a major emergency may be declared by the principal response agencies when responding to an incident in Dublin Port.

Dublin Fire Brigade provides the primary response to emergencies in the city and to the Port. The Council supports this response by providing amongst others, the following functions:

- coordinating the delivery of services from all council departments
- making buildings such as leisure and community centres available to people displaced by the emergency
- providing a volunteer civil defence organisation

- providing advice and assistance with clean up after major flooding or pollution
- assessing structural damage to buildings
- co-ordinating and leading multi-agency meetings to plan community recovery

Overall, and in accordance with the requirements of A Framework for Major Emergency Management, the Dublin City Council Major Emergency Plan has been prepared to facilitate the response to, and recovery from major emergencies as well as ensuring the Council's arrangements are coordinated with those of the other designated principal response agencies, the Health Service Executive and An Garda Síochána.

6.8.5 Emergency Response Exercises

DPC conducts regular emergency response exercises across its estate, covering incidents at the COMAH establishments in co-ordination with the operators of the establishments and with the emergency services, incidents at other facilities in the port, road traffic incidents including incidents outside the port estate that can have a knock-on effect on traffic within the port, and incidents at the ferry terminals or berths. These exercises test DPC's procedures, response actions and the resources that may be deployed (personnel and emergency response equipment), thereby ensuring that DPC is well prepared to respond to an incident or emergency.

6.9 Embedded Mitigation Measures

The following embedded measures are relevant to the risk of major accidents and disasters. The embedded measures will evolve over the development process as the EIA progresses.

The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

6.9.1 Construction Phase

The construction phase of the ABR2 Project presents the greater potential for a major accident to arise attributable to the project compared to the operational phase given the nature and extent of work in Alexandra Basin West and at the basin of Berths 52/53 and the potential interaction with vessel traffic and, of particular note, vessels conveying dangerous substances either in bulk (LPG or petroleum products) or in packages (in containers). While the control of vessel movements within the Port is strictly controlled under the Harbour Master, the Dublin Port Bye Laws, and the Notices to Mariners as part of the normal Port activities, the following additional measures will be implemented as part of the ABR2 Project.

1. The individual berths that will be unavailable during phases of the construction works will be identified in advance and Dublin Port Company will identify alternative berths to be used for the duration of the works. Changes to the availability of berths will be communicated to vessels operating at the Port in advance via Notices to Mariners.
2. A project specific vessel traffic / movement plan will be developed to manage the interaction between work vessels carrying out the dredging in Alexandra Basin West, work vessels carrying out the infilling in the basin of Berths 52/53, and supporting vessels. The plan will take into account

the need for commercial vessels to cross the route between Alexandra Basin West and the basin of Berths 52/53, and the potential conflicts between oil tankers and LPG vessels accessing the oil berths.

3. The Dublin Port Pilots will be advised of the vessel traffic management plan in advance and on an ongoing basis over the course of the ABR2 Project.

4. A traffic plan for the movement of ABR2 Project vehicles on the land side of the Port will be developed in advance to minimise where practicable, and manage the interaction between project vehicles and commercial and other traffic in the Port. Where practicable, the ABR2 Project traffic will be kept separate from vehicles transporting dangerous goods by road, either in bulk (road tankers conveying petroleum products or LPG road tankers) or in packages / containers.

While the construction stage mitigation measures are specific to the ABR2 Project in scope, Dublin Port Company manages the vessel traffic, road traffic, and the movement of dangerous goods as part of its normal operational activities, and therefore these mitigation measures do not represent a material change to Dublin Port Company's operations.

6.9.2 Operation Phase

The objective of the ABR2 Project is primarily to accommodate the construction of the Unified Ferry Terminal and the relocation of Berths 52/53 under the MP2 Project and therefore, in the context of the risk of major accidents and disasters, the operation phase of the ABR2 Project represents a return to the current (normal) operation of the Port. Therefore, from a major accidents and disasters perspective, Dublin Port Company's normal operating practices – the management of vessel traffic, the management of road traffic, the control over the transport of dangerous goods, and the oversight of the COMAH (and non-COMAH) establishments without the Port Estate constitute the mitigation measures relevant to the operation phase of the ABR2 Project.