Alexandra Basin Redevelopment 2

Bringing Dublin Port To 2040

# COMAH Land Use Planning Assessment



CALAFORT ÁTHA CLIATH
DUBLIN PORT

TETRA TECH

# COMAH Land Use Planning Assessment of ABR2 Project

***Prepared for*:**

**Dublin Port Company**

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**Byrne Ó Cléirigh**, 30a Westland Square, Pearse Street, Dublin 2, D02 PN76, Ireland.
Telephone: + 353 – 1 – **6770733**. Facsimile: + 353 – 1 – **6770729**. Email: **Admin@boc.ie**. Web: **www.boc.ie**

Directors: LM Ó Cléirigh BE MIE CEng FIEI FIMechE; LP Ó Cléirigh BE MEngSc MBA CEng FIEI FEI; ST Malone BE MIE CEng FIEI;
JB FitzPatrick FCA. Registered in Dublin, Ireland No. 237982.

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# 1 INTRODUCTION

Dublin Port is a key part of the national port system and Dublin Port Company (DPC) seeks to ensure that it plays its role in providing national port capacity. For all of Ireland's major national ports, it is essential that capacity constraints do not emerge which could lead to supply chain inefficiencies.

DPC is in the process of bringing forward a number of projects to planning from the Dublin Port Masterplan 2040 to achieve the port's ultimate capacity of 77.2 million tonnes of cargo throughput per annum by 2040, which has included the works undertaken in the ABR Project[1] for Alexandra Basin West and Berths 52/53. The ABR2 Project – the subject of this COMAH land use planning assessment –comprises redevelopment works in two areas of Dublin Port:

- Alexandra Basin West
- Berths 52/53

On completion the ABR2 Project in conjunction with the ABR Project will:

- Redevelop Alexandra Basin West to include new quays and jetties (now completed from the original ABR Project)
- Capital dredging to deepen the Alexandra Basin West to achieve standard depths of -10m CD and remediation of contaminated sediments on the bed of basin arising from historical industrial activities (subject to planning permission for the ABR2 Project)
- Provide infilling of the basin at Berths 52/53 with treated sediment arising from Alexandra Basin West (subject to planning permission for the ABR2 Project)
- Construction of new riverside Berths 52/53 to replace the existing Berths 52/53 (separately consented under the MP2 Project)

The ABR2 Project is in the vicinity of several establishments that fall within the scope of the *Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations*, 2015 (the COMAH Regulations), and it lies within the consultation distance of three COMAH establishments, namely Calor Teoranta, Circle K Energy Holding Limited, and Indaver Ireland Limited.

To support the project, Tetra Tech (Dublin Port Company's planning & environmental advisors) requested Byrne Ó Cléirigh to conduct a COMAH land use planning assessment of the development. The purpose of the assessment is to examine the development in the context of the Health and Safety Authority's COMAH land use planning guidance. This report describes our assessment of the development and our conclusions as to the individual and societal risk presented to the development from the COMAH establishments.

# 2 PLANNING CONTEXT

## 2.1 Planning & Development Regulations

Part 11 of the *Planning and Development Regulations*, as amended, sets out the requirements for planning applications relating to developments subject to the COMAH legislation. Article 137(1) requires that a planning authority[2] notifies the HSA where:

[1] The ABR Project is subject to a separate planning application and a separate COMAH land use planning assessment.

[2] A planning authority is defined as a local authority in the *Planning and Development Act*

*(b) a planning authority receives a planning application relating to development which would—*

*(i) be of a category listed in Table 1 of Schedule 8, and*

*(ii) be located within the distance listed in column 2 of Table 2 of Schedule 8 from an establishment of the corresponding type listed in column 1 of Table 2, or be located within such distance from a particular establishment as has been specified by the Health and Safety Authority in technical advice provided under article 27 of the Major Accident Regulations,*

*and the Health and Safety Authority has not previously provided, either in relation to the development to which the application relates or on a generic basis, relevant technical advice on the risk or consequences of a major accident,*

*(c) a planning authority receives a planning application relating to development which would, in its opinion, be–*

*(i) in the vicinity of an establishment, and*

*(ii) relevant to the risk or consequences of a major accident,*

*and the Health and Safety Authority has not previously provided, either in relation to the development to which the application relates or on a generic basis, relevant technical advice on the risk or consequences of a major accident, the planning authority shall notify the Health and Safety Authority.*

Article 141 of the Regulations applies to planning appeals to An Coimisiún Pleanála (formerly An Bord Pleanála) and places a similar obligation on ACP to notify the HSA of development at, in the vicinity of, or potentially affected by COMAH establishments.

As the ABR2 Project is within the Consultation Distance of three COMAH establishments, namely Calor Teoranta, Circle K Energy Holding Limited, and Indaver Ireland Limited (see Section 3.4) and may fall within one of the categories of development in Table 1 of Schedule 8 of the *Planning and Development Regulations* (a transport link), the provisions of Articles 137(1)(b) or 137(1)(c), or the corresponding provisions under Article 141 applicable to ACP, may apply.

## 2.2 An Coimisiún 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

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

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.

### 2.3 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).*

As set out in Section 4.1.1, 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.

## 3 DUBLIN PORT

### 3.1 Activities

The Port covers approximately 265 hectares to 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.

## 3.2 Dublin Port Company and the Dublin Port Masterplan 2040

Dublin Port Company (DPC) is a State-owned commercial company responsible for operating and developing Dublin Port.

Dublin Port is the largest freight and passenger port in Ireland, with all cargo handling activities being carried out by private sector companies operating in intensely competitive markets within the port.

Dublin Port has been identified as a Core Port of international significance in the Trans European Network (TEN-T) Guidelines, it forms part of the European Union's Core Transportation Network, and it is also designated a Tier 1 Port of national importance in the *National Ports Policy 2013*[4].

Dublin Port's large share of national port volumes, particularly in the Roll-On Roll-Off (Ro-Ro) and Lift-On Lift Off (Lo-Lo) modes, arises due to a combination of two factors: location and depth of water. Dublin Port is a key part of the national port system and DPC seeks to ensure that it plays its role in providing national port capacity. For all of Ireland's major national ports, it is essential that capacity constraints do not emerge which could lead to supply chain inefficiencies.

The Dublin Port Masterplan 2040 seeks to ensure that no capacity constraints emerge in Dublin Port between now and 2040.

The Dublin Port Masterplan 2040 sets out DPC's vision to transform Dublin Port into a highly land-efficient port, an attractive destination in its own right, and permeable to the people of Dublin to enjoy and experience the port's heritage in all its diversity from the natural environment to arts, and to local history.

At its core, the Dublin Port Masterplan 2040 aims to maximise the throughput on Dublin Port's fixed brownfield land area before seeking to develop additional port capacity at another east coast location.

DPC is in the process of bringing forward a number of projects to planning from the Dublin Port Masterplan 2040 to achieve the port's ultimate capacity of 77.2 million tonnes of cargo throughput per annum by 2040. This development has included:

- Northside
  - The MP2 Project, which redeveloped the port's internal road system, and includes a network of cycle and pedestrian routes throughout and on the periphery of the port (the Dublin Port Greenway).
  - The Alexandra Basin Redevelopment Project (ABR2 Project)
- Southside
  - The 3FM Project, the third and final major capital project from the Dublin Port Masterplan. The development focuses on Dublin Port Company-owned lands on the Poolbeg Peninsula and is currently progressing through the planning process.
- Dublin Inland Port, a 44-hectare site beside the M50, to provide capacity for port-related but non-core activities which have been removed from Dublin Port.

[4] The 2013 Policy remains the current policy; in October 2023, the Department for Transport commenced the first phase of a public consultation for the *Review of the National Ports Policy*.

## 3.3 ABR2 Project

The ABR2 Project has two key elements:

1. Alexandra Basin West: Completion of dredging within Alexandra Basin West, with dredging of the remaining 334,000 $m^3$ of contaminated material to a depth of -10.0 m CD over an area of 194,000 $m^2$ within the redeveloped Alexandra Basin West and its subsequent remediation.
2. Berth 52/53 Basin: Infilling of the Berth 52/53 (Terminal 5) basin of an area of 45,650 $m^2$ and the raising of existing levels by 1.4 m over an area of 95,000 $m^2$ for delivery of the Unified Ferry Terminal under the MP2 Project.

The area of the ABR2 Project is shown in Appendix 1, showing the following areas:

- ABR2 Study Area: the overall area of the ABR2 Project (subject to the supporting Environmental Impact Assessment)
- IE Licence Boundary: the area of the Industrial Emissions licence from the Environmental Protection Agency to cater for the dredging of contaminated material.
- ABW Dredging Area: the area of Alexandra Basin West (ABW) to be dredged.
- Infilling Area Basin 52/53: the area of the basin at Berths 52/53 to be infilled.
- Riverside Berth 52: the area of the new riverside Berth 52 to be constructed to the south of the infilled basin at Berths 52/53 (subject to a separate application for planning permission and a separate COMAH land use planning assessment).
- ABR2 Fill Area: the wider area of infilling at the basin for Berths 52/53 to accommodate the development of the Unified Passenger Terminal (subject to a separate application for planning permission and a separate COMAH land use planning assessment).
- Working Area ABR2: the designated working area to support and facilitate the works under the ABR2 Project.

## 3.4 COMAH Establishments

### 3.4.1 Overview

The COMAH establishments within the Port are listed in Table 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 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 | 600 m |
| Circle K Energy Holding Limited | Promenade Road, Dublin Port, Dublin 3 | Upper | Oil storage & distribution | 400 m & 300 m |
| Indaver Ireland Ltd. | Tolka Quay Road, Dublin Port, Dublin 1 | Upper | Hazardous waste | 700 m |

| Establishment | Location | Tier | Activity | Consultation Distance |
|---|---|---|---|---|
| Tedcastles Oil Products | Promenade Road, Parish of St. Thomas, Dublin Port, Dublin 1 | Upper | Oil storage & distribution | 400 m |
| Valero Energy Ireland Ltd. | Alexandra Road, Dublin Port, Dublin 1 | Upper | Oil storage & distribution | 400 m |
| Iarnród Éireann | Alexandra Road, North Wall, Dublin 1 | Lower | Oil storage | 300 m |
| Synergen Power Ltd t/a ESB Dublin Bay Power | Pigeon House Road, Ringsend, Dublin 4 | Lower | Oil storage (power generation) | 300 m |
| The National Oil Reserves Agency (NORA) | Shellybanks Road, Ringsend Dublin 4 | Upper | Oil storage | 300 m |
| The National Oil Reserves Agency | Pigeon House Road, Ringsend, Dublin 4 | Upper | Oil storage | 300 m |

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.

### 3.4.2 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.

### 3.4.3 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.

### 3.4.4 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.

### 3.4.5 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 six 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.

### 3.4.6 Valero Energy Ireland Ltd.

The Valero Energy establishment comprises two parts: the northern part to the north of Alexandra Road comprising six bunded areas[5] containing eleven bulk storage tanks for petroleum and renewable energy products, and the southern 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.

### 3.4.7 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.

### 3.4.8 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.

### 3.4.9 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

[5] One of the bunds contains two water tanks.

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 a class III petroleum product (diesel).

### 3.4.10The 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 class III petroleum product tanks (diesel), one of which serves the ESB Poolbeg generating station, and one class II petroleum product tank (kerosene). The Poolbeg tank farm is served by the existing jetty at the neighbouring ESB station and contains a road loading facility towards the south (between the western and eastern bunds).

### 3.4.11Summary of Storage Areas & Substances

Table 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 2.

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

| Establishment | Yard / Part of Site | Bunded Area | No. of tanks / containers (total) | COMAH Substances |
|---|---|---|---|---|
| Calor | - | - | 19 (tanks) | LPG |
| | | - | 20 (ISO containers) | 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<br>Class III petroleum<br>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<br>Class II petroleum<br>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<br>Class III petroleum |

| Establishment | Yard / Part of Site | Bunded Area | No. of tanks / containers (total) | COMAH Substances |
|---|---|---|---|---|
| | | Cup tank | 1 | Class II petroleum |
| | Yard 2 | Bund 1 | 6 | Class I petroleum<br>Class III petroleum |
| Valero Energy Ireland | North Yard | Bund 1 (west) | 2 | Class II petroleum |
| | | Bund 2 | 2 | Class I petroleum<br>Class II petroleum |
| | | Bund 3 | 2 | Ethanol |
| | | Bund 4 | 3 | Class I petroleum<br>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 |

### 3.4.12Generating 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[6].

## 3.5 Port & Surrounding Population

### 3.5.1 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
  - goods vehicle drivers that operate to / from the Port, including those associated with:
    i. direct Port activities (e.g. delivering / collecting cargo, such as containers or trailers, shipped to / from the Port)
    ii. 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)
    iii. 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
- 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 400 m to 750 m from the northern and western parts of the Port estate.

[6] 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.

- 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 550 m to 650 m 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)
- 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 3.

### 3.5.2 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 625 m 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
  - Dublin Bus garage

- To the west, in East Wall to the west and south of East Wall Road (approximately 200 m 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[7] 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.

### 3.5.3 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).

[7] 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.

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.

### 3.5.4 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.

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 increased 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 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[8]. 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 3)
- The car traffic associated with the ferry terminals is accounted for under the ferry traffic data in Section 3.5.7.
- 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 3.5.6 and 3.5.7 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 (50 km/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 10 km/h.

[8] *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.

**Table 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 (km/h) | Peak | 37.5 | 25.0 | 25.0 | 37.5 | 10.0 |
| | Off peak | 45.0 | 37.5 | 37.5 | 45.0 | 10.0 |
| % of total traffic | Peak | 52.4 | 9.7 | 31.8 | 1.3 | 1.4 |
| | 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 |

### 3.5.5 Shipping Traffic

Data from DPC[9] 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 vessels and passenger ferries, which are accounted for in Sections 3.5.6 and 3.5.7, respectively) is summarised in Appendix 4.

### 3.5.6 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 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.

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

### 3.5.7 Ferry Traffic

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

**Table 4: Dublin Port Terminals**

| Terminal | Operator | Traffic |
|---|---|---|
| 1 | Irish Ferries<br>Isle of Man Steam Packet Company (seasonal) | Passenger & freight<br>Passenger |
| 2 | Stena Line | Passenger & freight |
| 4 | CLdN | Ro-Ro freight |
| 5 | CLdN<br>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:

3. 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 (25 km/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.
4. 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.

### 3.5.8 Population Timeframes

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

**Table 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<br>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% |
| **Total** | - | - | - | - | **100.0%** |

Certain populations do not fall within the six 'standard' timeframes in Table 5, for example traffic is based on the ferry timetables, berth occupancy is based on shipping times. The populations associated with these other timeframes are apportioned across the six 'standard' 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%).

# 4 ASSESSMENT METHODOLOGY

## 4.1 COMAH Land Use Planning Guidance

### 4.1.1 EU Guidance

The EU's guidelines on land use planning[10] 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*

[10] *Land use Planning Guidelines in the Context of Directives 96/82/EC and 105/2003/EC*

- *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*
- *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*.

### 4.1.2 HSA Guidance

The HSA has set out its policy and approach to conducting land use planning assessments in its *Guidance on technical land-use planning advice* (2023). The HSA's guidance sets out the loss of containment events and the associated consequences – exposure to thermal radiation and / or overpressure effects – to be considered for sites that store flammable liquids, such as petroleum products. The **individual** risk is assessed in Section 7.1 and the **societal** risk is assessed in Section 7.2 against the HSA's criteria (described in Sections 4.2.1 and 4.2.2, respectively).

## 4.2 Assessment Criteria

### 4.2.1 Individual Risk

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

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

| Zone | Risk of fatality per year | | |
|---|---|---|---|
| Inner | $1 \times 10^{-5}$ | 1 in 100,000 | 0.001% |
| Middle | $1 \times 10^{-6}$ | 1 in 1 million | 0.0001% |
| Outer | $1 \times 10^{-7}$ | 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) the development lies within, as shown in Table 7 (a tick indicating 'do not advise against' and a cross indicating 'advise against').

**Table 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 in Section 6.2 and the results from the consequence assessment described in Section 4.3. 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 5.

### 4.2.2 Societal Risk

#### *4.2.2.1 Overview*

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* [Table 7]*… 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

#### *4.2.2.2 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.

### 4.2.3 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[11]:

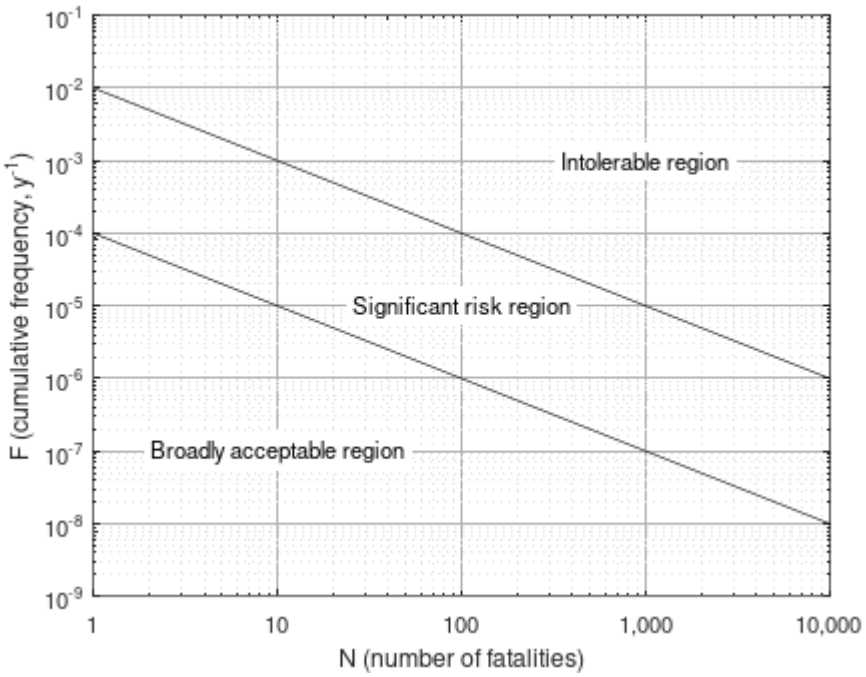
- Non-cumulative frequency basis: for these graphs, called f-N curves (lower case 'f'), the value plotted on the y-axis is the discrete frequency of experiencing exactly N fatalities.
- Cumulative frequency basis: for these graphs, called F-N curves (upper case 'F'), the value plotted on the y-axis is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

**Figure 1: Criterion Lines for FN Curves**




[11] Guidelines for Developing Quantitative Safety Risk Criteria, Centre for Chemical Process Safety, 2009

The number of (potential) fatalities, *N*, is on the x-axis and the probability of at least N fatalities is 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)[12].

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[13] 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.*

## 4.3 Consequences

### 4.3.1 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 ($kW/m^2$)
- 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 ($mg/m^3$ 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 4.3.4) and impacts on buildings and structures (see Section 4.3.5).

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:

[12] 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.

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

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

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 on 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.

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

### 4.3.3 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).

### 4.3.4 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.

### 4.3.5 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 (14.7 kW/m$^2$, 25.6 kW/m$^2$, and 37.5 kW/m$^2$), and for the effects of overpressures it sets out five levels for assessing structural damage (10 mbar, 35 mbar, 170 mbar, 350 mbar, and 830 mbar). 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 4.3.2 and 4.3.3, the responses 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.

## 4.4 Modelling Software

The loss-of-containment scenarios and corresponding end events (described in Section 6) 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 4.3.1, 4.3.2 and 4.3.3, 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 7.1) and the societal risk outputs (see Section 7.2). The modelling conditions are described in Section 4.5.

## 4.5 Modelling Conditions

The consequences associated with the major accident events (thermal radiation, overpressure) are dependent, to varying degrees, on certain ambient environmental conditions, summarised in the following sub-sections.

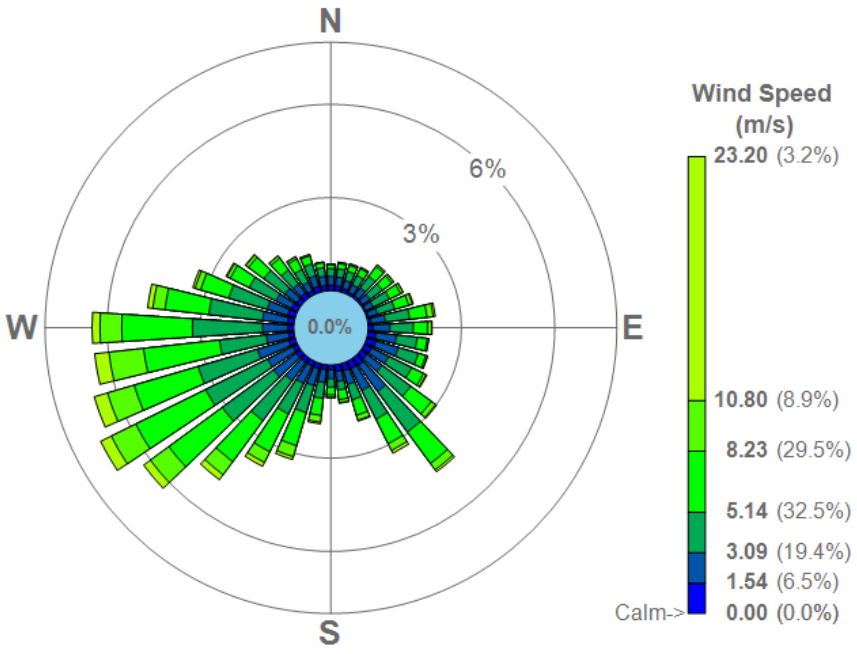
### 4.5.1 Wind speed

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 2 m/s (representative of low wind speed, nominally calm conditions) and 5 m/s (representative of typical wind speeds) are used.

### 4.5.2 Wind Direction

In addition to the wind speed (set at 5 m/s and 2 m/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 2.

**Figure 2: Dublin Airport Wind Rose (2006 – 2025)**



### 4.5.3 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.

### 4.5.4 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.

### 4.5.5 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.

### 4.5.6 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.

### 4.5.7 $CO_2$ 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%).

### 4.5.8 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.

### 4.5.9 Summary of ambient modelling conditions

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

**Table 8: Ambient modelling conditions**

| Parameter | 'Typical' (D5) conditions | 'Calm' (F2) conditions |
|---|---|---|
| Wind speed | 5 m/s | 2 m/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 | |

# 5 Development Sensitivity Levels

## 5.1 Overview

The HSA provides advice to the planning authorities using the approach described in Section 4.2. 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).

## 5.2 ABR2 Project

Table 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 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) |

| Zone | Development Type | Description / Example |
|---|---|---|
| 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 COMAH EVENTS

## 6.1 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 3.4.12, 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 6.2.

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 10.

**Table 10: Ignition categories of flammable fluids**

| Category / fluid | | 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 | |
| | 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 |

## 6.2 Scenarios

### 6.2.1 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[14] 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 11.

**Table 11: LPG and LNG scenarios**

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

[14] 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 pressurised cryogenic liquid. Since the temperature of LNG is significantly less than ambient temperature, a release of LNG is unlikely to result in the instantaneous vaporisation of the material, thereby resulting in a pool of liquid LNG.

### 6.2.2 Oil Storage

#### *6.2.2.1 Overview*

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.

#### *6.2.2.2 Ignition Category 0*

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.

#### *6.2.2.3 Buncefield Type 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[15], the three establishments that store gasoline – 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

[15] 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.

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 3.5 MJ/m³, using the TNO multi-energy model . This is broadly consistent with the UK HSE guidance[16] 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).
- The magnitude of the overpressure generated by the VCE is defined as that arising from a 50,000 m³ VCE with an ignition strength of 7 and a combustion energy of 3.5 MJ/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 50,000 m³ vapour cloud are set out in the UK HSE Research Report RR512[16], as shown in Table 12.

**Table 12: 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 |

#### *6.2.2.4 Ignition Category 2 & 3*

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 10 mm 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.

[16] RR512 Review of significance of societal risk for proposed revision to land use planning arrangements for large scale petroleum storage sites.

#### *6.2.2.5 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.

The layout of the COMAH establishments and individual bunds in the Port 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 since 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.

#### *6.2.2.6 Summary of Events*

The scenarios for ignition category 0, 2 and 3 substances in this assessment are shown in Table 13.

**Table 13: 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 | $9.96 \times 10^{-7}$ | 091 | Circle K Yard 2<br>Circle K Yard 4<br>TOP Yard 1<br>TOP Yard 2<br>Valero North |
| | | VCE | $1.82 \times 10^{-6}$ | 092 | |
| | | Flash fire | $5.46 \times 10^{-7}$ | 093 | |
| | | None | $1.64 \times 10^{-6}$ | 094 | |
| | Continuous leak over 10 minutes | Pool fire | $9.96 \times 10^{-7}$ | 095 | |
| | | VCE | $1.82 \times 10^{-6}$ | 096 | |
| | | Flash fire | $5.46 \times 10^{-7}$ | 097 | |
| | | None | $1.64 \times 10^{-6}$ | 098 | |
| | 10mm pipe leak over 30 minutes | Pool fire | $1.99 \times 10^{-5}$ | 099 | |
| | | VCE | $3.64 \times 10^{-5}$ | 100 | |
| | | Flash fire | $1.09 \times 10^{-5}$ | 101 | |
| | | None | $3.28 \times 10^{-5}$ | 102 | |
| | Instantaneous failure - overtop | Pool fire | $9.96 \times 10^{-7}$ | 103 | |
| | | VCE | $1.82 \times 10^{-6}$ | 104 | |
| | | Flash fire | $5.46 \times 10^{-7}$ | 105 | |
| | | None | $1.64 \times 10^{-6}$ | 106 | |

| Substance | LOC scenario | End event | Frequency (per tank-year) | HSA event ref. | Establishment |
|---|---|---|---|---|---|
| Ignition category 0 (cont/d) | Buncefield-type event | VCE | $1.00 \times 10^{-6}$ | Section 3.6.1 | Circle K Yard 2<br>Circle K Yard 4<br>TOP Yard 1<br>TOP Yard 2<br>Valero North |
| Ignition category 2 | Instantaneous failure | Pool fire | $5.00 \times 10^{-8}$ | 123 | Circle K Yard 2<br>Valero North |
| | | None | $4.95 \times 10^{-6}$ | 124 | |
| | Continuous leak over 10 minutes | Pool fire | $5.00 \times 10^{-8}$ | 125 | |
| | | None | $4.95 \times 10^{-6}$ | 126 | |
| | 10mm pipe leak over 30 minutes | Pool fire | $1.00 \times 10^{-6}$ | 127 | |
| | | None | $9.90 \times 10^{-5}$ | 128 | |
| | Instantaneous failure - overtop | Pool fire | $5.00 \times 10^{-8}$ | No ref. | |
| | | None | $4.95 \times 10^{-6}$ | No ref. | |
| Ignition category 3 | Instantaneous failure - overtop | Pool fire | $5.00 \times 10^{-8}$ | No ref. | Circle K Yard 1<br>Circle K Yard 2<br>Circle K Yard 3<br>Circle K Yard 4<br>TOP Yard 1<br>TOP Yard 2<br>Valero South<br>Iarnród Éireann<br>Synergen<br>NORA Ringsend<br>NORA Poolbeg |
| | | None | $4.95 \times 10^{-6}$ | No ref. | |

### 6.2.3 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 13.
- 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 14.

**Table 14: 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 | $5.00 \times 10^{-8}$ | 123 | Indaver |
| | | None | $4.95 \times 10^{-6}$ | 124 | |
| | Continuous leak over 10 minutes | Pool fire | $5.00 \times 10^{-8}$ | 125 | |
| | | None | $4.95 \times 10^{-6}$ | 126 | |
| | 10 mm pipe leak over 30 minutes | Pool fire | $1.00 \times 10^{-6}$ | 127 | |
| | | None | $9.90 \times 10^{-5}$ | 128 | |
| | Instantaneous failure - overtop | Pool fire | $5.00 \times 10^{-8}$ | No ref. | |
| | | None | $4.95 \times 10^{-6}$ | No ref. | |
| Dangerous substance warehouse (drum store) | Fire – 10% of inventory | Fire | $1.00 \times 10^{-3}$ | 167 | |
| | Fire – 100 % of inventory | Fire | $1.00 \times 10^{-4}$ | 168 | |

### 6.2.4 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 15.

**Table 15: Generating stations scenarios**

| Substance | LOC scenario | End event | Frequency (per m) | HSA event ref. | Establishment |
|---|---|---|---|---|---|
| Natural gas | Aboveground pipeline rupture | Fireball/jet fire | $1.00 \times 10^{-8}$ | 087 & Table 42 | ESB Northwall<br>ESB Poolbeg<br>Poolbeg FlexGen<br>Synergen / Dublin Bay Power<br>Dublin Bay Power FlexGen |
| | | Flash fire | $3.60 \times 10^{-8}$ | | |
| | | VCE | $5.40 \times 10^{-8}$ | | |
| | Aboveground pipeline leak | Fireball/jet fire | $5.00 \times 10^{-8}$ | 088 & Table 42 | |
| | | Flash fire | $1.80 \times 10^{-7}$ | | |
| | | VCE | $2.70 \times 10^{-7}$ | | |

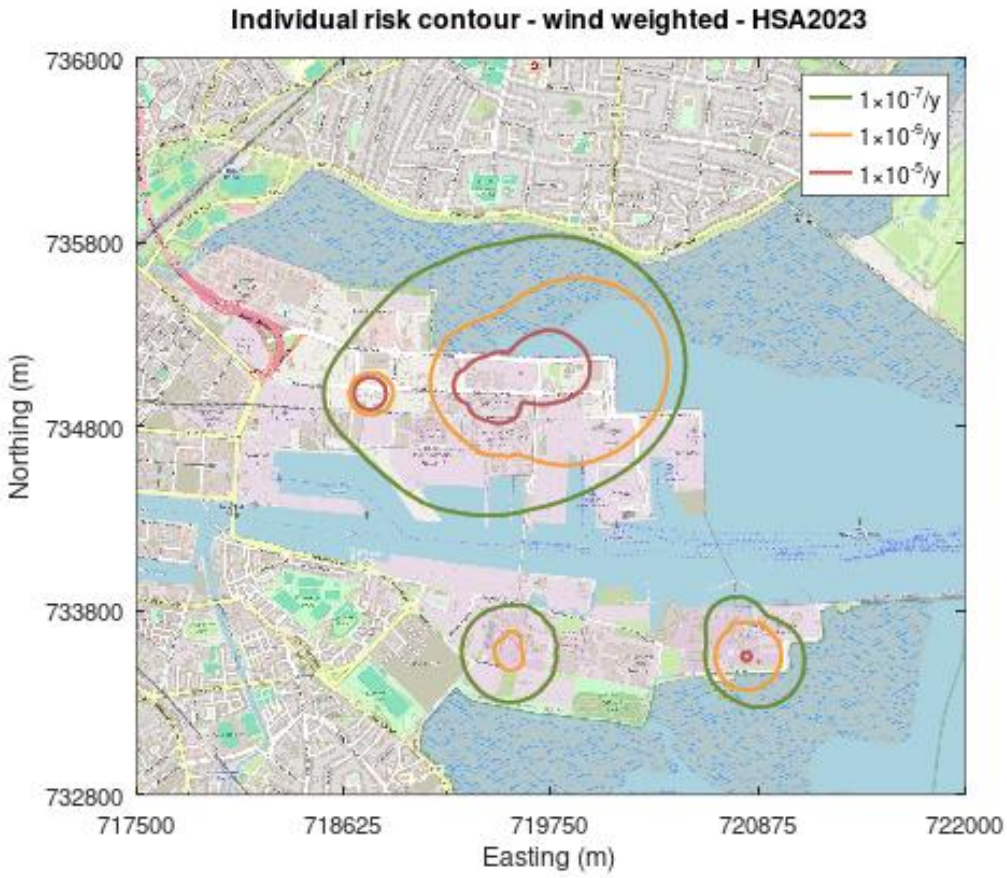
| Substance | LOC scenario | End event | Frequency (per m) | HSA event ref. | Establishment |
|---|---|---|---|---|---|
| Natural gas (cont/d) | Underground pipeline rupture | Fireball/jet fire | $1.00 \times 10^{-9}$ | 089 & Table 42 | ESB Northwall<br>ESB Poolbeg<br>Poolbeg FlexGen<br>Synergen / Dublin Bay Power<br>Dublin Bay Power FlexGen |
| | | Flash fire | $3.60 \times 10^{-9}$ | | |
| | | VCE | $5.40 \times 10^{-9}$ | | |
| | Underground pipeline leak | Fireball/jet fire | $5.00 \times 10^{-9}$ | 090 & Table 42 | |
| | | Flash fire | $1.80 \times 10^{-8}$ | | |
| | | VCE | $2.70 \times 10^{-8}$ | | |

# 7 Risk Assessment Results

## 7.1 Individual Risk

The aggregated risk contours for the inner, middle, and outer zones around the COMAH establishments are shown in Figure 3 and in Appendix 6.

**Figure 3: Individual risk contours**




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 7.

## 7.2 Societal Risk

### 7.2.1 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.

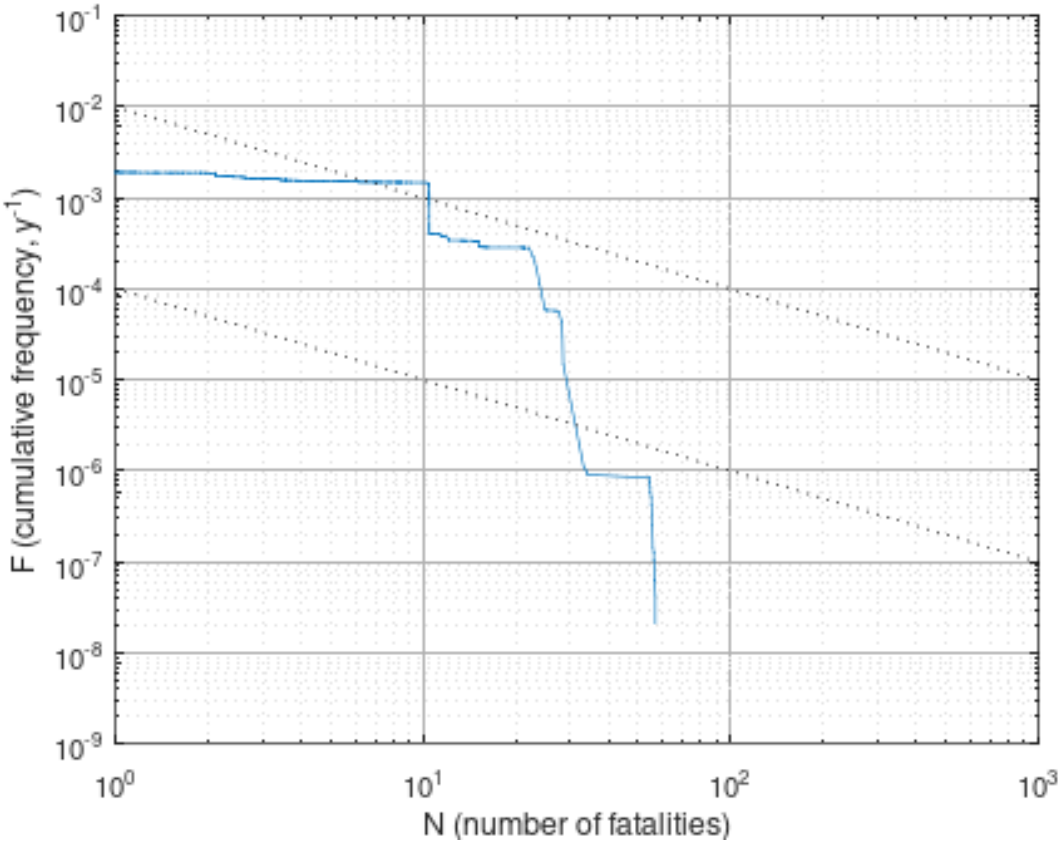
Therefore, for the societal risk assessment, the expectation value has been estimated based on a conservative estimate of the number of workers in the area of the ABR2 Project (nominally the working area shown in Appendix 6) during the construction stage of the ABR2 Project. The EV associated with the (temporary) working population is estimated at approximately 110, based on an average individual risk in the working area of $1.07 \times 10^{-7}$ (0.107 CPM – chances per million). This EV is substantially less than the HSA's upper limit of 10,000. 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 7.2.2.

### 7.2.2 FN Curve

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 4, taking into account the estimated population of the Port and the surrounding area as described in Section 3.5.

Figure 4 shows that a small section of the curve lies marginally above the upper 'tolerability' line. However, as noted in Section 4.2.3, 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 4: FN curve for Dublin Port**




## 7.3 HSA 2026 Land Use Planning Consultation

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 intends to assess the risks 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 adopted, this COMAH land use planning assessment is based on the HSA's current guidance (2023).

# 8 Emergency Response Management

## 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.

## 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.

## 8.3 Dublin Port Emergency Management Plan

### 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.

### 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.

### 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.

## 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 emergencies 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.

## 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.

# 9 CONCLUSIONS

Based on this conservative assessment, in our opinion the proposal for the ABR2 Project within Dublin Port satisfies the HSA's criteria under its land use planning guidelines. For individual risk:

- No part of the proposed ABR2 Project falls within the inner zones.
- Only a small part of the ABR2 Project falls within the middle zone, namely part of the working area at the east end of the Port to the north of the infilling of the basin at Berths 52/53. This working area falls within sensitivity level 1 as a work area or, at worst, sensitivity level 2 as a large work area or an area for outdoor use. In either case, the working area satisfies the HSA's criteria under its land use planning guidance.
- The outer zone extends over part of the ABR2 Project to the west (the dredging area in Alexandra Basin West) and to the east (the work area at the basin at Berths 52/53 and the infilling area of the basin). These parts of the ABR2 Project – as is the case for all parts of the ABR2 Project – constitute work areas under the project and therefore fall within sensitivity level 1 or, at worst, sensitivity level 2, both of which are compatible with the outer zone.

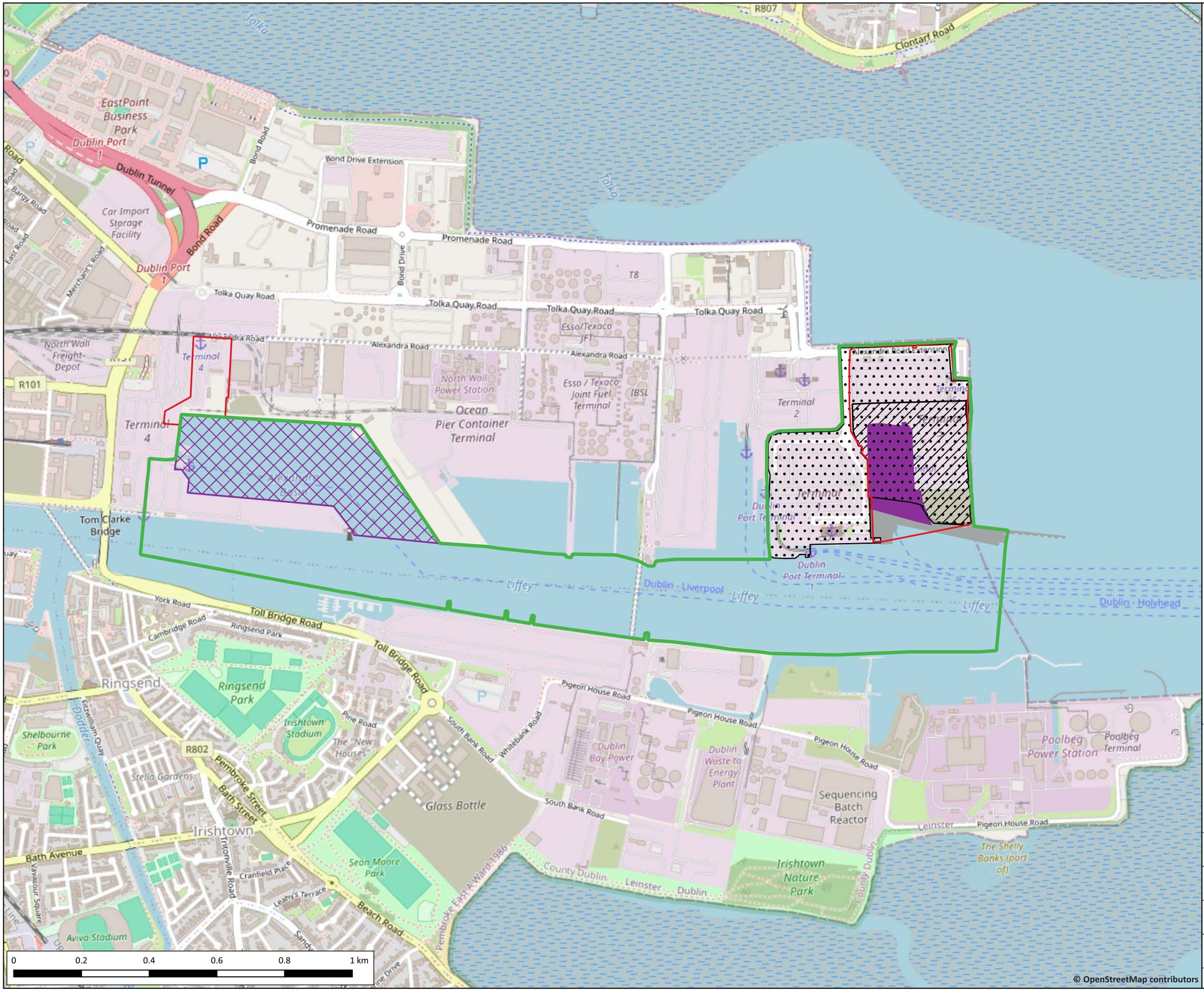
In the case of the societal risk criteria, the ABR2 Project does not alter the COMAH establishments or change the overall population within the Port. Therefore there is no material change in the risk profile other than during the works, with the Expectation Value associated with the construction phase of the project significantly less than the HSA's threshold (approximately 110 compared to an upper threshold of 10,000).

The Port has developed and implements a comprehensive emergency management plan that caters for the range of accident and emergency events that may occur within its estate (or that may occur outside the estate and that have a direct, knock-on effect), and this plan is provided to the other relevant stakeholders, including An Garda Síochána, Dublin City Council, Transport Infrastructure Ireland, and the Principal Response Agencies. In the event of an incident at a COMAH establishment that could impact on people at other facilities in the Port, or on road traffic entering or exiting the Port, DPC activates its emergency management plan, in which case people are directed away from the source of the hazard.

In our opinion, the potential major accident risks associated with the proposed ABR2 Project satisfy the Health and Safety Authority's COMAH land use planning guidance.

* * * * *

# APPENDIX 1: ABR2 PROJECT





**Byrne Ó Cléirigh Ltd.**

30A Westland Square
Pearse Street, Dublin 2, D02 PN76, Ireland
t: 353 1 677 0733 | f: +353 1 677 0729 | e: info@boc.ie
www.boc.ie


| | |
|---|---|
| Client | **Dublin Port Company** |
| Project | **ABR2 Project** |
| Title | **ABR2 Project Layout** |
| Drg No | **541-26X0060 R0 Appendix 1** |
| Rev | R1 |
| Scale | 1:10,000 |
| FBS | 07.08.03 |
| Date | 12 June 2026 |

## APPENDIX 2: COMAH ESTABLISHMENTS




**Legend**

Dublin Port COMAH establishments

- Lower tier
- Upper tier
- Individual bund (secondary containment)

N


**Byrne Ó Cléirigh Ltd.**

30A Westland Square
Pearse Street, Dublin 2, D02 PN76, Ireland
t: 353 1 677 0733 | f: +353 1 677 0729 | e: info@boc.ie
www.boc.ie


| | |
|---|---|
| Client | **Dublin Port Company** |
| Project | **ABR2 Project** |
| Title | **Dublin Port COMAH Establishments & Bunds** |
| Drg No | **541-26X0060 R0 Appendix 2** |
| Rev | R1 |
| Scale | 1:7,500 |
| FBS | 07.08.03 |
| Date | 12 June 2026 |

## APPENDIX 3: POPULATION DATA

**Table 16: Small Area population data (2022 Census data)**

| Small Area | Population Note 1 | Centre Note 2 | | Small Area | Population Note 1 | Centre Note 2 | |
|---|---|---|---|---|---|---|---|
| | | X | Y | | | X | Y |
| 268042008 | 293 | 720562.6 | 736111.1 | 268044003 | 355 | 718880.3 | 736460.0 |
| 268110002 | 179 | 718046.9 | 733695.9 | 268043003 | 300 | 719385.6 | 736154.4 |
| 268110013 | 202 | 718054.9 | 734129.1 | 268048009 | 180 | 717935.6 | 736449.4 |
| 268042025 | 247 | 721250.5 | 736368.2 | 268143024/04 | 195 | 717691.1 | 734104.5 |
| 268115008 | 130 | 717543.2 | 733586.9 | 268044004 | 322 | 719006.2 | 736520.6 |
| 268042018 | 298 | 720324.9 | 736326.4 | 268042014 | 340 | 721090.5 | 736431.9 |
| 268111012 | 212 | 718515.7 | 732927.4 | 268110006 | 346 | 718162.6 | 733552.1 |
| 268115004 | 270 | 717968.9 | 733472.8 | 268043006 | 242 | 719759.3 | 736143.7 |
| 268111001 | 300 | 718224.7 | 732890.5 | 268108008/03 | 308 | 717784.5 | 735129.6 |
| 268111009 | 298 | 718813.0 | 733063.5 | 268115017 | 30 | 717523.9 | 733345.0 |
| 268111007 | 309 | 718979.8 | 732914.5 | 268050001 | 212 | 717619.9 | 736718.2 |
| 268048001 | 238 | 717969.8 | 736604.9 | 268108010 | 198 | 717727.0 | 735175.0 |
| 268115007 | 259 | 717672.2 | 733788.4 | 268108026/01 | 790 | 717800.2 | 734489.5 |
| 268111006 | 340 | 718508.2 | 733325.7 | 268115005 | 186 | 717612.4 | 732933.5 |
| 268112013 | 6 | 718875.0 | 732808.6 | 268044009 | 359 | 719024.3 | 736161.9 |
| 268048011 | 142 | 718494.8 | 736478.2 | 268108011 | 128 | 717525.8 | 735540.2 |
| 268042016 | 25 | 721042.2 | 736771.7 | 268143027 | 179 | 717546.5 | 733953.3 |
| 268050002 | 77 | 717717.0 | 736761.4 | 268041007 | 1 | 721605.8 | 736789.1 |
| 268050009 | 68 | 717866.3 | 736775.7 | 268108001 | 243 | 717764.6 | 735373.2 |
| 268048010 | 299 | 718375.2 | 736421.3 | 268108029/01 | 127 | 717631.1 | 734759.1 |
| 268108021/01 | 193 | 717764.8 | 734712.7 | 268110016 | 322 | 718583.0 | 733577.5 |
| 268110012 | 231 | 717936.8 | 734180.0 | 268110019 | 234 | 718396.6 | 733540.7 |
| 268048017 | 286 | 718618.7 | 736625.0 | 268108020 | 523 | 717815.1 | 734632.5 |
| 268042005 | 343 | 720385.8 | 735811.7 | 268111004 | 218 | 718248.2 | 733207.3 |
| 268116008 | 98 | 717729.2 | 732854.1 | 268049010 | 100 | 717559.2 | 736397.0 |
| 268042026 | 216 | 720967.5 | 736258.9 | 268110009 | 202 | 717962.0 | 733925.5 |
| 268044005 | 246 | 719238.4 | 736513.0 | 268110001 | 185 | 718231.1 | 733465.8 |
| 268115002 | 137 | 717548.2 | 733710.9 | 268042023 | 226 | 720722.2 | 736354.7 |
| 268108002 | 226 | 717731.1 | 735295.6 | 268110007 | 255 | 718181.4 | 733641.5 |

| Small Area | Population Note 1 | Centre Note 2 | | Small Area | Population Note 1 | Centre Note 2 | |
|---|---|---|---|---|---|---|---|
| | | X | Y | | | X | Y |
| 268048016 | 231 | 718410.1 | 736591.4 | 268143024/01 | 152 | 717859.1 | 733950.4 |
| 268044008 | 260 | 719015.3 | 736030.1 | 268044006 | 324 | 719114.7 | 736432.4 |
| 268044002 | 143 | 719368.8 | 736719.4 | 268108009 | 279 | 717640.6 | 735217.0 |
| 268108013 | 158 | 717563.4 | 735574.7 | 268044007 | 337 | 719348.5 | 736406.0 |
| 268110005 | 171 | 718147.9 | 733736.0 | 268049001 | 70 | 717535.2 | 736566.8 |
| 268143030 | 7 | 717501.6 | 733934.2 | 268042011 | 38 | 720507.6 | 736773.1 |
| 268116013 | 217 | 717948.5 | 732941.8 | 268112015 | 39 | 719163.3 | 732827.6 |
| 268115013 | 163 | 717584.9 | 733493.1 | 268116012 | 106 | 717970.8 | 732853.6 |
| 268108022 | 205 | 717575.4 | 735006.2 | 268108023 | 213 | 717593.3 | 735116.5 |
| 268042021 | 69 | 720635.6 | 736780.5 | 268115021 | 281 | 718017.1 | 733308.3 |
| 268070022/01 | 1 | 718007.7 | 736798.9 | 268042006 | 168 | 720660.0 | 736005.1 |
| 268042002 | 303 | 720235.4 | 735945.8 | 268117005 | 1 | 717501.3 | 732859.7 |
| 268115001 | 186 | 717650.5 | 733632.2 | 268110008 | 295 | 718407.4 | 733902.4 |
| 268108025 | 25 | 717513.0 | 735055.1 | 268049004 | 281 | 717890.4 | 736067.1 |
| 268143024/03 | 216 | 717810.1 | 734238.5 | 268115014 | 259 | 717721.4 | 733414.1 |
| 268042024 | 164 | 721047.2 | 736296.4 | 268110010 | 196 | 718080.1 | 733923.5 |
| 268042003 | 146 | 720415.6 | 735886.8 | 268042019 | 122 | 720169.2 | 736334.5 |
| 268048007 | 148 | 718054.5 | 736498.1 | 268115006 | 168 | 717543.3 | 733812.3 |
| 268048002 | 229 | 718087.1 | 736654.2 | 268042007 | 299 | 720885.0 | 736038.7 |
| 268115016 | 1 | 717501.0 | 733389.7 | 268108008/01 | 125 | 717741.8 | 734990.4 |
| 268049007 | 211 | 717713.7 | 736599.5 | 268043002 | 284 | 719826.1 | 736480.8 |
| 268110003 | 377 | 718033.2 | 733799.9 | 268111011 | 244 | 718679.1 | 732887.5 |
| 268043012 | 278 | 720009.3 | 736695.8 | 268115023 | 311 | 717905.8 | 733155.9 |
| 268108003 | 16 | 717514.0 | 734959.7 | 268050005 | 13 | 717508.7 | 736723.4 |
| 268110018 | 223 | 718362.1 | 733685.3 | 268042001 | 228 | 720208.4 | 736093.6 |
| 268043005 | 185 | 719794.5 | 735975.6 | 268143028 | 267 | 717642.2 | 733894.2 |
| 268048014 | 189 | 718702.9 | 736735.6 | 268108005 | 60 | 717532.4 | 735459.6 |
| 268108021/02 | 904 | 717872.9 | 734710.1 | 268115003 | 161 | 717665.0 | 733700.0 |
| 268048015 | 44 | 718325.1 | 736722.2 | 268048006 | 6 | 718906.5 | 736780.8 |
| 268048003 | 285 | 718482.0 | 736269.5 | 268115011 | 131 | 717531.1 | 733511.9 |
| 268043004 | 193 | 719450.0 | 736003.9 | 268115015 | 171 | 717842.7 | 733641.0 |
| 268115019 | 110 | 717563.5 | 733234.1 | 268049009 | 251 | 717693.3 | 736423.8 |

| Small Area | Population Note 1 | Centre Note 2 | | Small Area | Population Note 1 | Centre Note 2 | |
|---|---|---|---|---|---|---|---|
| | | X | Y | | | X | Y |
| 268049008 | 328 | 717852.2 | 736593.2 | 268115020 | 114 | 717614.6 | 733138.6 |
| 268043008 | 26 | 719991.9 | 736787.0 | 268143024/02 | 132 | 717561.9 | 734222.5 |
| 268042020 | 281 | 720474.1 | 736614.2 | 268117006 | 13 | 717510.0 | 732821.2 |
| 268110014 | 188 | 718025.2 | 734039.1 | 268108029/02 | 376 | 717708.5 | 734706.5 |
| 268111008 | 155 | 718668.3 | 733185.0 | 268042012 | 209 | 720865.9 | 736723.0 |
| 268043009 | 5 | 719861.0 | 736792.5 | 268048013 | 246 | 718622.5 | 736462.2 |
| 268043011 | 326 | 720007.8 | 736000.4 | 268110011 | 157 | 718193.2 | 734099.7 |
| 268042027 | 100 | 720294.9 | 736760.7 | 268111002 | 325 | 718351.3 | 733052.4 |
| 268048012 | 405 | 718778.2 | 736497.9 | 268042022 | 146 | 720852.4 | 736490.0 |
| 268042010 | 274 | 720232.4 | 736605.2 | 268042028 | 14 | 720375.8 | 736794.0 |
| 268048008 | 238 | 718136.0 | 736433.2 | 268042004 | 203 | 720474.2 | 735990.0 |
| 268043001 | 304 | 719785.9 | 736322.0 | 268042009 | 388 | 720621.2 | 736206.8 |
| 268115022 | 174 | 717863.0 | 733259.4 | 268110020 | 204 | 718575.2 | 734027.7 |
| 268043010 | 199 | 719712.9 | 736727.9 | 268114013 | 57 | 718046.3 | 732835.1 |
| 268115009 | 377 | 717618.3 | 733521.1 | 268143031 | 120 | 717762.6 | 733912.4 |
| 268111010 | 225 | 718513.0 | 733102.2 | 268111003 | 212 | 718277.5 | 733346.4 |
| 268115010 | 26 | 717507.6 | 733541.0 | 268108006 | 196 | 717590.2 | 735390.7 |
| 268108028 | 71 | 717535.0 | 734877.2 | 268115018 | 190 | 717616.0 | 733046.5 |
| 268042015 | 225 | 721145.4 | 736603.9 | 268108008/02 | 347 | 717900.5 | 735164.6 |
| 268110017 | 499 | 718714.3 | 733749.8 | 268115012 | 134 | 717570.4 | 733477.5 |
| 268042013 | 301 | 720688.0 | 736557.0 | 268042017 | 91 | 721698.3 | 736040.6 |
| 268043007 | 260 | 719724.9 | 736597.4 | 268110004 | 278 | 718207.1 | 733808.9 |

Notes

1. The population of the Small Area lying within the assessment domain.
2. The co-ordinates of the centroid of the Small Area lying within the assessment domain.

**Table 17: Estimate of population in Poolbeg West Strategic Development Zone**

| Planning ref. | Area | Day-time | Night-time | Any-time | Other time | Other time occupancy |
|---|---|---|---|---|---|---|
| PWSDZ3207/21 | Block M&O | 0 | 0 | 1,000 | 0 | 0.00% |
| PWSDZ3207/21 | Block K | 25 | 0 | 500 | 90 | 29.68% |
| PWSDZ4341/23 | Block L | 25 | 0 | 810 | 0 | 0.00% |
| PWSDZ3062/24 | Block P | 478 | 0 | 0 | 0 | 0.00% |
| PWSDZ3062/24 | Block P | 298 | 0 | 0 | 0 | 0.00% |
| PWSDZ3062/24 | Block P | 113 | 0 | 0 | 0 | 0.00% |
| PWSDZ3062/24 | Block P | 353 | 0 | 0 | 0 | 0.00% |
| PWSDZ3700/24 | Phase 2 | 0 | 0 | 1,255 | 0 | 0.00% |
| PWSDZ3700/24 | Phase 2 | 111 | 0 | 0 | 0 | 0.00% |
| PWSDZ3700/24 | Phase 2 | 14 | 0 | 0 | 0 | 0.00% |
| PWSDZ3700/24 | Phase 2 | 0 | 0 | 0 | 356 | 50.00% |
| PWSDZ3700/24 | Phase 2 | 0 | 0 | 0 | 386 | 50.00% |
| PWSDZ3798/24 | Phase A | 3,689 | 0 | 0 | 0 | 0.00% |

**Table 18: Estimate of commercial & industrial population**

| Area | Location | Day-time | Night-time | Any-time | Other time | Other time occupancy |
|---|---|---|---|---|---|---|
| North Port | Boliden | 5 | 0 | 0 | 2 | 9.52% |
| | Bord na Móna | 0 | 0 | 0 | 0 | 0.00% |
| | Border Control Post | 10 | 0 | 2 | 0 | 0.00% |
| | Calor | 1 | 4 | 0 | 0 | 0.00% |
| | Circle K Terminal | 3 | 2 | 0 | 2 | 9.52% |
| | Circle K Yard 1 | 0 | 0 | 0 | 1 | 9.52% |
| | Circle K Yard 2 | 0 | 0 | 0 | 1 | 9.52% |
| | Circle K Yard 3 | 0 | 0 | 0 | 1 | 9.52% |
| | Circle K Yard 4 | 15 | 5 | 0 | 5 | 9.52% |
| | Container Parking | 6 | 3 | 0 | 3 | 9.52% |
| | Custom House | 20 | 0 | 0 | 0 | 0.00% |
| | Darland Enterprises Limited | 15 | 0 | 0 | 4 | 9.52% |
| | DFT Shipping | 50 | 0 | 0 | 0 | 0.00% |
| | Doyle Shipping Group | 10 | 0 | 0 | 0 | 0.00% |
| | Doyle Shipping Group | 4 | 0 | 0 | 0 | 0.00% |
| | Dublin Port Centre | 75 | 0 | 0 | 2 | 100.00% |
| | Dublin Port Co. Port Service Station | 20 | 0 | 0 | 0 | 0.00% |
| | Dublin Port Maintenance Department | 20 | 0 | 0 | 0 | 0.00% |
| | Dublin Stevedores | 20 | 10 | 0 | 10 | 9.52% |
| | ESB Northwall Generating Station | 9 | 3 | 0 | 3 | 9.52% |
| | Eucon Shipping | 10 | 5 | 0 | 5 | 9.52% |
| | Gwynedd Shipping | 20 | 0 | 0 | 4 | 9.52% |
| | Indaver Ireland | 22 | 0 | 0 | 0 | 0.00% |
| | Inspection Services Limited | 10 | 0 | 0 | 0 | 0.00% |
| | Irish Bitumen Storage Ltd. | 10 | 0 | 0 | 0 | 0.00% |
| | Irish Rail | 0 | 0 | 0 | 2 | 9.52% |
| | Irish Tar & Bitumen Supplies | 20 | 0 | 0 | 0 | 0.00% |
| | KC Commercials | 0 | 0 | 0 | 0 | 0.00% |
| | O'Reilly Transport | 10 | 0 | 0 | 2 | 9.52% |

| Area | Location | Day-time | Night-time | Any-time | Other time | Other time occupancy |
|---|---|---|---|---|---|---|
| North Port | R&H Hall Limited | 5 | 0 | 0 | 2 | 9.52% |
| | R&H Hall Limited | 15 | 0 | 0 | 2 | 9.52% |
| | T10 Department of Agriculture Food & the Marine | 15 | 5 | 0 | 5 | 9.52% |
| | T9 Department of Agriculture Food & the Marine | 15 | 5 | 0 | 5 | 9.52% |
| | Tedcastles Oil Products Yard 1 | 35 | 10 | 0 | 10 | 9.52% |
| | Tedcastles Oil Products Yard 2 | 0 | 0 | 0 | 1 | 9.52% |
| | Terminal 1 | 20 | 10 | 0 | 20 | 9.52% |
| | Terminal 2 | 10 | 5 | 0 | 10 | 9.52% |
| | Terminal 4 | 10 | 5 | 0 | 3 | 9.52% |
| | Terminal 4 | 10 | 5 | 0 | 3 | 9.52% |
| | Terminal 5 offices | 5 | 5 | 0 | 5 | 9.52% |
| | Terminal 7 | 25 | 0 | 0 | 4 | 9.52% |
| | Valero North | 0 | 0 | 0 | 1 | 9.52% |
| | Valero South | 15 | 5 | 0 | 5 | 9.52% |
| South Port | All Away Waste | 4 | 0 | 0 | 0 | 0.00% |
| | Dublin Container & Transport Services Limited | 8 | 0 | 0 | 0 | 0.00% |
| | Dublin Waste to Energy - (Covanta Plant) | 60 | 4 | 2 | 1 | 8.33% |
| | Ecocem Ireland | 6 | 0 | 0 | 0 | 0.00% |
| | ESB Dublin Poolbeg Generating Station | 20 | 4 | 4 | 1 | 8.33% |
| | Hammond Lane Metal Recycling | 24 | 0 | 0 | 0 | 0.00% |
| | John Bisset Engineering | 0 | 0 | 2 | 0 | 0.00% |
| | John Nolan Transport | 0 | 0 | 2 | 0 | 0.00% |
| | Kilsaran South Bank Road | 20 | 0 | 0 | 0 | 0.00% |
| | Marine Terminals Limited | 50 | 5 | 2 | 1 | 8.33% |
| | Murphy Ireland | 15 | 0 | 0 | 0 | 0.00% |
| | NORA Poolbeg Oil Storage Terminal | 1 | 0 | 0 | 1 | 8.33% |
| | Poolbeg AGI | 31 | 1 | 0 | 1 | 8.33% |
| | Poolbeg Flexgen | 15 | 0 | 0 | 0 | 0.00% |

| Area | Location | Day-time | Night-time | Any-time | Other time | Other time occupancy |
|---|---|---|---|---|---|---|
| South Port | Ringsend Flexgen | 10 | 0 | 0 | 0 | 0.00% |
| | Ringsend Wastewater Treatment Plant | 55 | 5 | 0 | 1 | 8.33% |
| | Rock Solid Staging Limited | 5 | 0 | 0 | 0 | 0.00% |
| | Rushfleet Containers | 5 | 0 | 0 | 0 | 0.00% |
| | Synergen Power Limited | 40 | 4 | 4 | 1 | 8.33% |
| 3FM | Plot K - staffing levels | 21 | 0 | 2 | 32 | 57.36% |
| | Plot N - staffing levels | 56 | 0 | 2 | 50 | 42.69% |
| | Plot O - staffing levels | 14 | 0 | 2 | 12 | 42.86% |
| | Plot K - vessel crew | 0 | 0 | 0 | 14.5 | 57.36% |
| | Plot N - vessel crew | 0 | 0 | 0 | 15 | 42.69% |

## APPENDIX 4: SHIPPING TRAFFIC DATA

**Table 19: Dublin Port Berth Occupancy (2025)**

| Berth | Arrivals Note 1 | Departures Note 1 | Number of days occupied Note 2, 3 | % of time occupied Note 2, 3 | Estimated population range Note 4 |
|---|---|---|---|---|---|
| 18 | 152 | 152 | 311.3 | 85.3% | 0 - 1,199 |
| 19 | 3 | 4 | 3.3 | 0.9% | 34 |
| 21 | 58 | 58 | 60.6 | 16.6% | 12 - 34 |
| 26 | 485 | 485 | 197.7 | 54.2% | 12 - 34 |
| 27 | 239 | 240 | 139.3 | 38.2% | 12 - 34 |
| 49 | 1,448 | 1,448 | 199.1 | 54.5% | 18 - 2,000 |
| 50 | 4 | 3 | 166.3 | 45.6% | 3 - 15 |
| 50A | 128 | 128 | 183.9 | 50.4% | 12 - 15 |
| 50N | 208 | 208 | 254.0 | 69.6% | 12 - 15 |
| 50S | 165 | 165 | 243.4 | 66.7% | 8 - 35 |
| 51 | 1,339 | 1,340 | 201.8 | 55.3% | 405 - 1,500 |
| 51A | 561 | 562 | 172.7 | 47.3% | 18 - 1,970 |
| 52 | 662 | 661 | 125.3 | 34.3% | 10 - 630 |
| 53 | 8 | 6 | 390.4 | 107.0% | 0 - 10 |
| Alex Basin East 39 | 415 | 414 | 297.6 | 81.5% | 8 - 2,728 |
| Alex Quay West 28 | 83 | 82 | 241.0 | 66.0% | 8 - 25 |
| Alex Quay West 29 | 13 | 13 | 18.8 | 5.2% | 3 - 25 |
| Alex Quay West 30 | 3 | 3 | 2.4 | 0.7% | 10 - 15 |
| Alex Quay West 31 | 1 | 1 | 1.0 | 0.3% | 10 |
| Deep Water Berth 46 | 62 | 62 | 116.1 | 31.8% | 3 - 636 |
| Deep Water Berth 47 | 68 | 69 | 120.2 | 32.9% | 3 - 820 |
| MTL 42 | 115 | 115 | 163.2 | 44.7% | 8 - 2,728 |
| MTL 44 | 140 | 140 | 255.1 | 69.9% | 8 - 2,728 |
| MTL 45 | 91 | 91 | 145.1 | 39.7% | 10 - 2,728 |
| Nth Wall Quay 17 | 4 | 4 | 0.9 | 0.3% | 0 Note 5 |
| Ocean Pier 33 | 251 | 252 | 198.4 | 54.4% | 10 - 1,885 |
| Ocean Pier 35 | 72 | 71 | 126.5 | 34.7% | 10 - 850 |
| Ocean Pier 37 | 142 | 142 | 128.1 | 35.1% | 3 - 2,000 |
| Oil Berth No. 1 | 194 | 194 | 212.2 | 58.1% | 10 - 22 |

| Berth | Arrivals Note 1 | Departures Note 1 | Number of days occupied Note 2, 3 | % of time occupied Note 2, 3 | Estimated population range Note 4 |
|---|---|---|---|---|---|
| Oil Berth No. 2 | 182 | 181 | 201.5 | 55.2% | 10 - 4,212 |
| Oil Berth No. 3 | 81 | 81 | 89.6 | 24.5% | 6 - 40 |
| Oil Berth No. 4 | 9 | 9 | 11.6 | 3.2% | 10 - 25 |
| Poolbeg Marina | 1 | 1 | 0.1 | 0.0% | 13 |
| Ringsend Dock/Gut | 2 | 1 | 5.0 | 1.4% | 5 - 96 |
| SJR Quay 9 | 6 | 6 | 16.5 | 4.5% | 10 - 28 |

Notes

1. The number of arrivals and departures is per calendar year, and accounts for arrivals to and departures from the port, as well as movements between berths while a vessel remains in port.
2. Estimated berth occupancies are based on DPC Port arrival & departure data for 2025 (available at http://booking.dublinport.ie/webx/)
3. Certain berths can accommodate more than one vessel at a time and therefore can have an occupancy greater than 100%. During 2025, two barges were at Berth 53 for a total of 195 days (CW-9 barge) and 169 days (Wilcarry 1500 barge). Several other vessels also berthed at Berth 53 (e.g. general cargo, tugs) for a total of 26 days, yielding an occupancy greater than 100%.
4. Estimated berth populations are based on the typical complement for the types of vessels moored at the berths. For larger vessels (cruise ships and passenger vessels), the estimates are based on the available data for passenger and crew capacities.
5. The activity at Nth Wall Quay 17 in 2025 is recorded as ‘bridge lift’.

## APPENDIX 5: CRUISE VESSEL POPULATION DATA

**Table 20: Cruise vessel data (2025)**

| Vessel | No. visits | Berths used | Complement | Number of days in port |
|---|---|---|---|---|
| Aurora | 44 | Alex Basin East 39<br>MTL 42<br>MTL 44<br>MTL 45 | 2,728 | 102.33 |
| Azamara Journey | 2 | 18 | 1,101 | 2.33 |
| Azamara Quest | 2 | 18 | 1,094 | 2.14 |
| Europa | 1 | 18 | 683 | 0.54 |
| Hamburg | 2 | 28<br>D.L.2 | 590 | 1.04 |
| Hanseatic Nature | 1 | 18 | 405 | 0.68 |
| Island Sky | 2 | 28<br>D.L.2 | 186 | 1.95 |
| Le Bellot | 3 | 18 | 302 | 1.65 |
| Magnifica | 2 | Oil Berth No. 2 | 4,212 | 3.08 |
| Seabourn Venture | 1 | 18 | 384 | 0.48 |
| Silver Shadow | 1 | 18 | 694 | 0.73 |
| Silver Wind | 8 | 18 | 502 | 6.52 |
| Sirena | 3 | 18 | 1,199 | 1.60 |
| Star Legend | 3 | D.L.2 | 372 | 1.58 |
| Sylvia Earle | 1 | D.L.2 | 194 | 0.52 |
| World Explorer | 2 | 18 | 302 | 1.98 |
| World Traveller | 3 | 18<br>D.L.4 | 323 | 1.89 |
| World Voyager | 4 | 18 | 309 | 5.64 |

## APPENDIX 6: INDIVIDUAL RISK CONTOURS

**Legend**

Individual risk contours

- $1 \times 10^{-7}$ per year
- $1 \times 10^{-6}$ per year
- $1 \times 10^{-5}$ per year

N

0 0.2 0.4 0.6 0.8 1 km

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**Byrne Ó Cléirigh Ltd.**

30A Westland Square
Pearse Street, Dublin 2, D02 PN76, Ireland
t: 353 1 677 0733 | f: +353 1 677 0729 | e: info@boc.ie
www.boc.ie


| | |
|---|---|
| Client | **Dublin Port Company** |
| Project | **ABR2 Project** |
| Title | **Individual Risk Contours** |
| Drg No | **541-26X0060 R0 Appendix 6.1** |
| Rev | R1 |
| Scale | 1:10,000 |
| FBS | 07.08.03 |
| Date | 12 June 2026 |

**Legend**

Individual risk contours

- $1 \times 10^{-7}$ per year
- $1 \times 10^{-6}$ per year
- $1 \times 10^{-5}$ per year

**ABR2 Project**

- ABR2 Study Area
- IE License Boundary
- ABW Dredging Area
- Working Area ABR2
- Infilling Area Basin 52/53
- Riverside Berth 52
- ABR2 Fill Area

N

0 0.2 0.4 0.6 0.8 1 km

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**Byrne Ó Cléirigh Ltd.**

30A Westland Square
Pearse Street, Dublin 2, D02 PN76, Ireland
t: 353 1 677 0733 | f: +353 1 677 0729 | e: info@boc.ie
www.boc.ie

| | |
|---|---|
| Client | **Dublin Port Company** |
| Project | **ABR2 Project** |
| Title | **Individual Risk Contours overlaid on ABR2 Project** |
| Drg No | **541-26X0060 R0 Appendix 6.2** |
| Rev | R1 |
| Scale | 1:10,000 |
| FBS | 07.08.03 |
| Date | 12 June 2026 |