Old Nangor Road Ltd
Flood Risk Assessment

Technical Report

July 21

2021s0772

Old Nangor Road Ltd
156 Crodaun Forest Park
CELLBRIDGE
Co Kildare

JBA Project Manager

Ross Bryant
24 Grove Island
Corbally
Limerick
Ireland

Revision History

Revision Ref / Date Issued	Amendments	Issued to
S3-P01	Initial Issue	Old Nangor Road

Contract

This report describes work commissioned by Sean Martyn, on behalf of Old Nangor Road Ltd, by an email dated 20/05/2021. Ross Bryant and Ben Murphy of JBA Consulting carried out this work.

Prepared by ..... Ben Murphy BA, MSc
Analyst

Reviewed by ..... Ross Bryant BSc MSc CEnv MCIWEM C.WEM
Principal Analyst

Purpose

This document has been prepared an FRA for Old Nangor Road Ltd. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

JBA Consulting has no liability regarding the use of this report except to Old Nangor Road Ltd.

Copyright

Carbon Footprint

A printed copy of the main text in this document will result in a carbon footprint of if 100% post-consumer recycled paper is used and if primary-source paper is used. These figures assume the report is printed in black and white on A4 paper and in duplex.

JBA is aiming to reduce its per capita carbon emissions.

Contents

List of Figures

Abbreviations

1D	One Dimensional (modelling)
2D	Two Dimensional (modelling)
AEP	Annual Exceedance Probability
CFRAM	Catchment Flood Risk Assessment and Management
DoEHLG	Department of the Environment, Heritage and Local Government
FARL	FEH index of flood attenuation due to reservoirs and lakes
FB	Freeboard
FFL	Finish Floor Levels
FRA	Flood Risk Assessment
FSR	Flood Studies Report
FSU	Flood Studies Update
GSI	Geological Survey of Ireland
LHB	Left Hand Bank
OPW	Office of Public Works
PFRA	Preliminary Flood Risk Assessment
RFI	Request for Further Information
RHB	Right Hand Bank
RR	Rainfall-Runoff
SAAR	Standard Average Annual Rainfall (mm)
SFRA	Strategic Flood Risk Assessment
URBEXT	FEH index of fractional urban extent
WL	Water Level

1 Introduction

Under the Planning System and Flood Risk Management Guidelines for Planning Authorities (DoEHLG & OPW, 2009) proposed development must undergo a Flood Risk Assessment prior to planning to ensure sustainability and effective management of flood risk

1.1 Terms of Reference and Scope

JBA Consulting was appointed by Kavanagh Burke Consulting Engineers to prepare a Flood Risk Assessment (FRA) for a proposed redevelopment of an existing commercial site on Neilstown Road, Clondalkin, Dublin.

1.2 Flood Risk Assessment; Aims and Objectives

This study is being completed to inform the future development of the site as it relates to flood risk. It aims to identify, quantify and communicate to the client the risk of flooding to land, property and people and the measures that would be recommended to manage the risk in order to facilitate the development of the site.

The objectives of the FRA are to:

- Identify potential sources of flood risk;
- Confirm the level of flood risk and identify key hydraulic features;
- Assess the impact that the proposed development has on flood risk in the vicinity of the site;
- Develop appropriate flood risk mitigation and management measures which will allow for the long-term development of the site.

Recommendations for development have been provided in the context of the OPW/DECLG planning guidance, "The Planning System and Flood Risk Management". A review of the likely effects of climate change, and the long-term impacts this may have on development has also been undertaken.

For general information on flooding, the definition of flood risk, flood zones and other terms see 'Understanding Flood Risk' in Appendix A.

1.3 Development Proposal

The proposed redevelopment on Neilstown Road consists of a public house, a carpark with no.15 spaces, a bin store and no.29 apartments.

The proposed layout for the ground floor is presented in Figure 1-1.

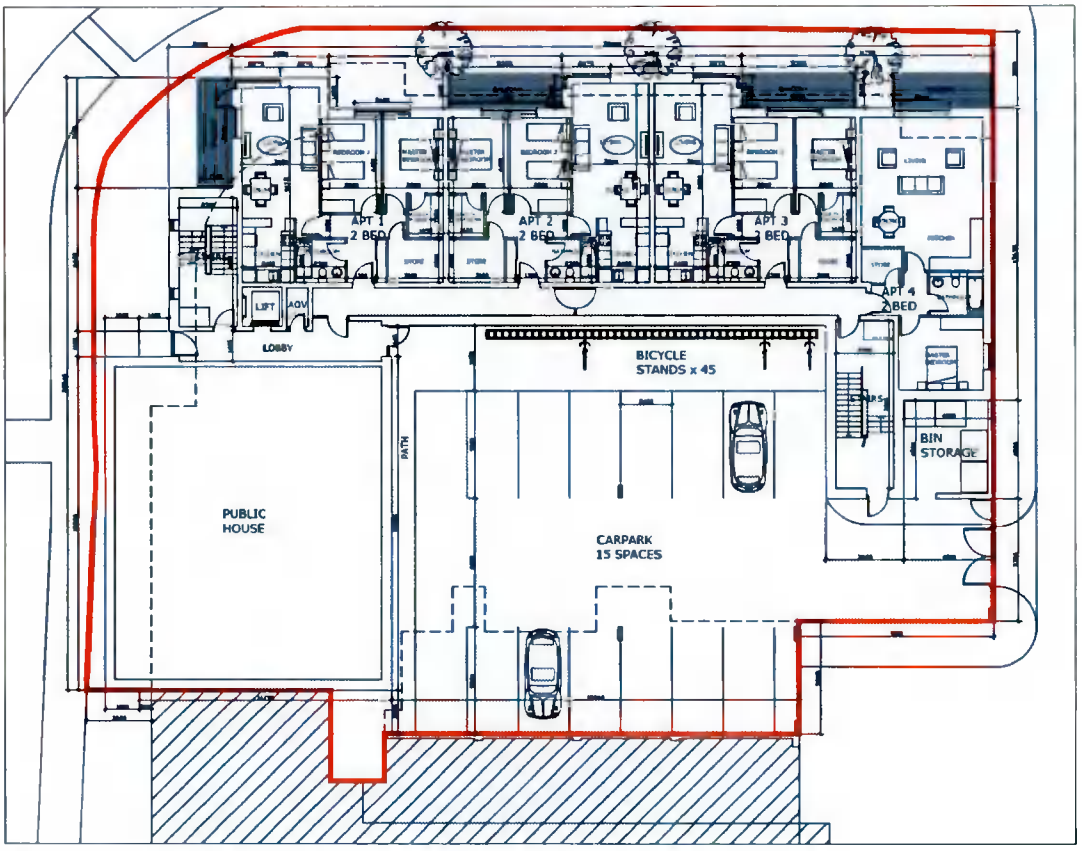


Figure 1-1: Proposed ground floor

1.4 Report Structure

Section 2 of this report gives an overview of the study location and associated watercourses. Section 3 contains background information and initial assessment of flood risk. Site-specific flood risk assessment and mitigation measures are discussed in Section 4. Conclusions are outlined in Section 5.

2 Site Background

This section describes the proposed development site on Neilstown Road, including watercourses, geology and wider geographical area.

2.1 Location

The proposed redevelopment site is located along Neilstown Road, refer to Figure 2-1. The site is located in an urban area surrounded by various residential and commercial properties.

Access to the site is via Collinstown Road.

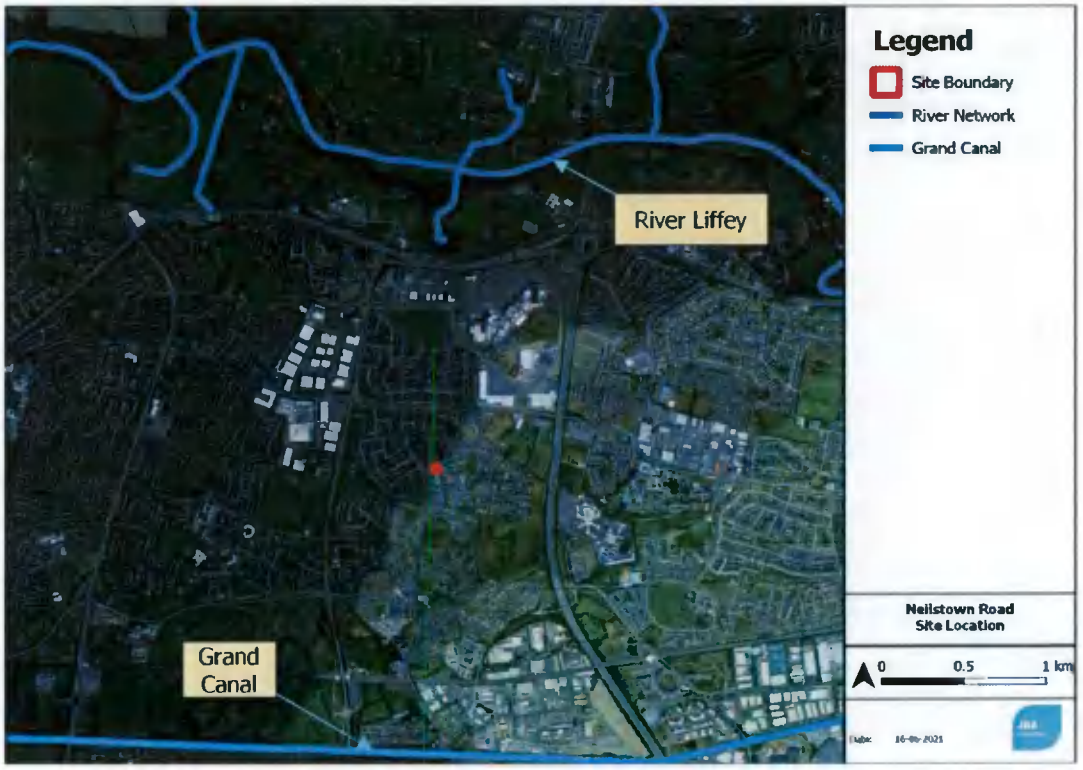


Figure 2-1: Site location and watercourses

2.2 Watercourses

The River Liffey and the Grand Canal are the main hydrological features in the area, which are located 1.8km north and 1.7km south of the site respectively. The River Liffey and Grand Canal flow in a westerly direction.

2.3 Site Geology

The groundwater and geological maps of the site are provided by the Geological Survey of Ireland (GSI). The subsoil is Made Ground, as expected. The underlying bedrock is classified as Lucan Formation which is described as dark-grey to black, fine-grained micritic limestones.

Figure 2-2: Neilstown Road Soils (Source; GSI Database)

2.4 South Dublin County Development Plan 2016-2022

Under the South Dublin County Development Plan 2016-2022 the subject site has been zoned LC; To protect, improve and provide for the future development of Local Centres.

3 Flood Risk Identification

An assessment of the potential for and scale of flood risk at the site is conducted using historical and predictive information. This identifies any sources of potential flood risk to the site and reviews historic flood information. The findings from the flood risk identification stage of the assessment are provided in the following sections.

3.1 Flood History

A number of sources of flood information were reviewed to establish any recorded flood history at, or near the site. This includes the OPW's website, www.floodmaps.ie and general internet searches.

3.1.1 Floodmaps.ie

The OPW host a National Flood hazard mapping website, www.floodmaps.ie, which highlights areas at risk of flooding through the collection of recorded data and observed flood events. As seen in Figure 3-1, there is no information about historic flood events at the site or immediate surrounding area. The main flood events recorded occur along the River Liffey. The closest historic flood events to the site are:

- Recurring flood event at Beech Row Ronanstown, (south of the site). Source of recurring flood: Associated with Liffey Catchment.
- Single flood event at R109 Strawberry Beds (to the north west of the site) November 2002.
- Single flood event at Strawberry Beds (to the north east of the site) June 1993.

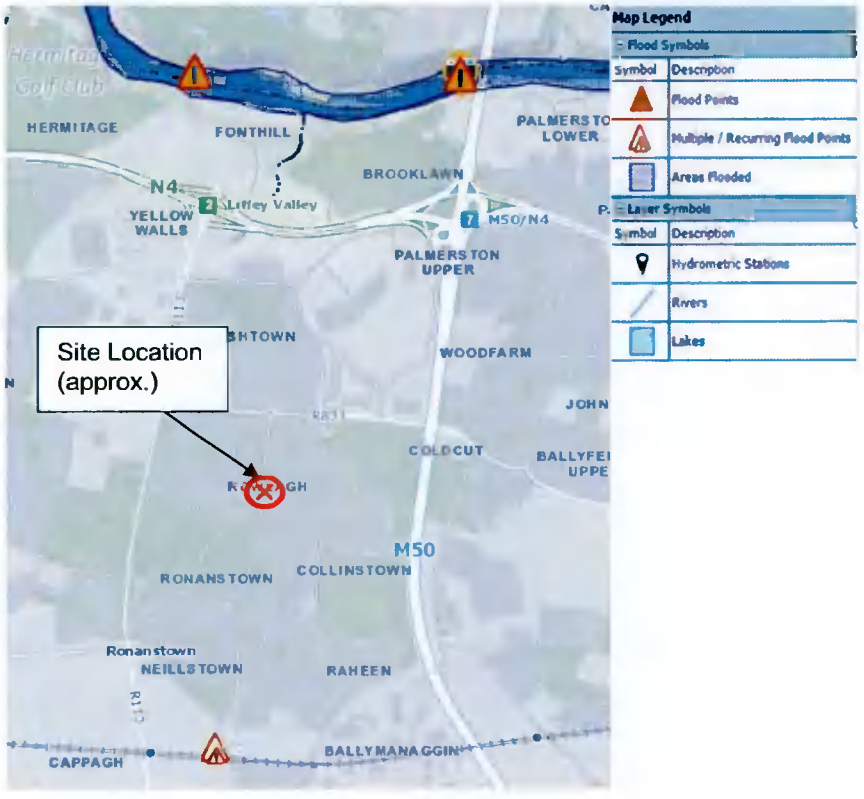


Figure 3-1: Floodmaps.ie

3.1.2 Internet Searches

An internet search was conducted to gather information about whether the site was affected by flooding previously. No flooding incidents were recorded at the site.

3.2 Predictive Flooding

The subject area has been a subject of three predictive flood mapping or modelling studies and other related studies and plans:

- OPW Preliminary Flood Risk Analysis (PFRA);
- Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022
- Eastern Catchment Flood Risk Assessment and Management Study.

The level of detail presented by each method varies according to the quality of the information used and the approaches involved. The Eastern CFRAM is the most detailed assessment of flood extent and supersedes the fluvial flood outlines presented by the OPW PRFA study.

3.2.1 OPW PFRA

The preliminary Flood Risk Assessment (PFRA) is a requirement of the EU Flood Directive (2007/60/EC). One of the PFRA deliverables is flood probability mapping for various sources: pluvial (surface water), groundwater, fluvial and tidal. The PFRA is a preliminary or 'indicative' assessment and analysis has been undertaken to identify areas potentially prone to flooding. The OPW PFRA study has largely been superseded by the CFRAM programme however, it does provide valuable information regarding pluvial and groundwater flooding. It should also be noted that the PFRA maps have been updated, however these have not been made available at the time of writing.

3.2.2 Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022

The Strategic Flood Risk Assessment has been prepared as part of the South Dublin County Council Development Plan 2016-2022. The SFRA has informed the strategic land use planning decisions by providing an assessment of all flood risk within South County Dublin and enables the application of the sequential approach including the Justification Test. A range of flood maps from a number of sources were reviewed as part of the SFRA to inform the use of the Justification Test for developments at risk of flooding. In addition to the Justification Test, various flood management policies and objectives are included within the South Dublin County Council Development Plan 2016-2022.

The SFRA was based on the historical information from floodmaps.ie and predictive flood maps sourced from CFRAM.

3.2.3 Eastern CFRAM

The primary source of data with which to identify flood risk to the site is the Eastern CFRAM. Flood maps have been finalised for South Dublin County. The nearest modelled watercourse is the River Liffey, which is located c 1.8km north of the site. An extract of the flood map is presented in below.

Review of Figure 3-2 confirms that the site and the surrounding area are not identified at risk of flooding during the 1% or 0.1% AEP flood events.

Figure 3-2: Eastern CFRAM Flood Map

3.3 Flood Sources

The initial stage of a Flood Risk Assessment requires the identification and consideration of probable sources of flooding. Following the initial phase of this Flood Risk Assessment, it is possible to summarise the level of potential risk posed by each source of flooding. The flood sources are described below.

3.3.1 Fluvial

There are two major watercourses located near the site, the River Liffey and the Grand Canal. After studying the flooding data from the OPW CFRAM, SFRA, PFRA, historic data and local topography, there is a very low probability of flooding from either of these watercourses to the proposed development site.

3.3.2 Tidal

The development site is not identified as being at risk of coastal flooding as suggested by the OPW PFRA and CFRAM mapping.

3.3.3 Pluvial/ Surface Water

Pluvial, or surface water, flooding is the result of rainfall-generated flows that arise before run-off can enter a watercourse or sewer. It is usually associated with high intensity rainfall. Flood risk from pluvial sources exists in all areas. Adequate storm water drainage systems will minimise the pluvial flood risk.

Specific mitigation measures will be discussed in Section 4.2.2.

3.3.4 Groundwater

Groundwater flooding results from high sub-surface water levels that impact upper levels of the soil strata and overland areas that are usually dry. The groundwater vulnerability has been classified as 'Extreme' by the GSI groundwater vulnerability maps. The site is already fully covered in hardstanding, thus it has been screened out at this stage.

4 Flood Risk Assessment

4.1 Flood Risk

Review of the available historic and predictive flood risk information contained in Section 3 confirms that the proposed development site is located in Flood Zone C. This means the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both rivers and coastal floods). There is no identified historic or predicted fluvial flooding within the site boundary or surrounding area.

This FRA therefore confirms the site as being located within Flood Zone C. Although the residential unit is highly vulnerable to the impacts of flooding, it is an appropriate use within Flood Zone C, where the risk is low.

4.2 Mitigation

4.2.1 Finished Floor Levels

Based on review of the available information, the site is shown to be within Flood Zone C. To minimise flood risk it is recommended that the ground floor Finish Floor Level (FFL) be placed 150mm above the external hardstanding area.

4.2.2 Surface Water Design

TBC

The surface water design is set out under separate cover by the Kavanagh Burke Drainage Design Report. It can be paraphrased as follows:

There is an existing 225mm diameter surface water drain located in the footpath of Collinstown Road. The surface water drainage design for the site will comply with the GDSDS with an allowable discharge to the public system restricted to Greenfield Runoff Rate QBAR for the site. The flow restriction will be achieved by providing a flow control device (Hydrobrake or similar) on the outfall from the attenuation tank.

Due to the nature of this brown field site and the proposed high density development with car park underneath, attenuation ponds and storm water disposal through soakage in swales or wetlands are not applicable. Notwithstanding this it is proposed the alternative SUDS items forming a complete storm water runoff management train.

The treatment train approach was applied to both the storm water network and the attenuation design to ascertain that both runoff quality and quantity are appropriately addressed. An array of techniques was used to fulfil requirements of each element of the treatment train:

- Pollution prevention – to prevent chemicals and other pollutants from contaminating the rainfall runoff, maintenance regime will be established and it will include regular sweeping of the car park and collection of rubbish. Provided waste bins will be sheltered to prevent the rainfall flushing the contaminants out of them.
- Source control and site control – to detain and infiltrate the runoff as close as possible to the point of origin and to deal with as much of the runoff as possible on site an "extensive" sedum type green roof is proposed to the roof of the apartment block. This will be made up of fabric mats sown with sedum planting. This roof type allows for storm water interception and disposal through transpiration and evaporation. In addition to quantity reduction, the green roofs will improve the quality of the runoff and will become a wildlife habitat, improve biodiversity and boost the environmental credentials of the development. According to CIRIA 697 SUDS Manual, typical green roofs should attenuate storms up to a two-year return period event.
- Regional control – to mimic the behaviour of the green field site and protect the receiving watercourse, the attenuation tank is designed to cater for all durations of rainfall up to 100 years return period. The design up to 100 years return will minimise the flooding potential of the receiving watercourse and other watercourses within this catchment. The storm water network and the proposed attenuation storage was checked in the drainage modelling and analysis computer software and no flooding on site was indicated for all storms up to 100

years return period of all durations with 20% CCF. The results of both 30 and 100 years storm analysis can be found in Appendices of this report.

4.2.3 Access

Vehicular access to the development is via Collinstown Road. The site is located in Flood Zone C and therefore access is not considered an issue.

4.3 Residual Risk/Additional Assessment

Residual risks are the risks that remain after all risk avoidance, substitution and mitigation measures have been taken. The residual risks are summarised in Table 4-1.

Table 4-1: Summary of Residual Risk

RESIDUAL RISK	MITIGATION MEASURES
Climate Change Impacts (fluvial)	The site is raised significantly above and far away from the River Liffey and risk is low.
Climate Change Impacts (pluvial)	The storm water design incorporates storage allowance for climate change.
Drainage system failure	The Stormwater drainage system is designed to contain a 1% AEP storm event. The design FFLs provide sufficient freeboard above surrounding ground levels to protect against surface water system failure and all levels around the site slope away from the building.

5 Conclusion

JBA Consulting has undertaken a detailed Flood Risk Assessment for the proposed redevelopment along Neilstown Road, Dublin. The site is currently occupied by a commercial facility. It is proposed to develop a number of residential apartment blocks within the site boundary.

From reviewing the available sources of flooding the site has been shown to reside in Flood Zone C and is at a low risk of inundation from tidal and fluvial sources. No historic flooding was identified at the site or surrounding area. Review of the CFRAM flood map confirm that the site is not at risk of inundation from the 1% AEP & 0.1% AEP events. Residual risk has been assessed and managed.

The Flood Risk Assessment was undertaken in accordance with 'The Planning System and Flood Risk Management' guidelines and confirm that the development resides in Flood Zone C and is in agreement with the core principles contained within.

Appendices

A Appendix - Understanding Flood Risk

Flood Risk is generally accepted to be a combination of the likelihood (or probability) of flooding and the potential consequences arising. Flood Risk can be expressed in terms of the following relationship:

Flood Risk = Probability of Flooding x Consequences of Flooding

A.1 Probability of Flooding

The likelihood or probability of a flood event (whether tidal or fluvial) is classified by its Annual Exceedance Probability (AEP) or return period years, a 1% AEP flood 1 in 100 chance of occurring in any given year. In this report, flood frequency will primarily be expressed in terms of AEP, which is the inverse of the return period, as shown in the table below and explained above. This can helpful when presenting results to members of the public who may associate the concept of return period with a regular occurrence rather than an average recurrence interval and is the terminology which will be used throughout this report.

Table: Conversion between return periods and annual exceedance probabilities

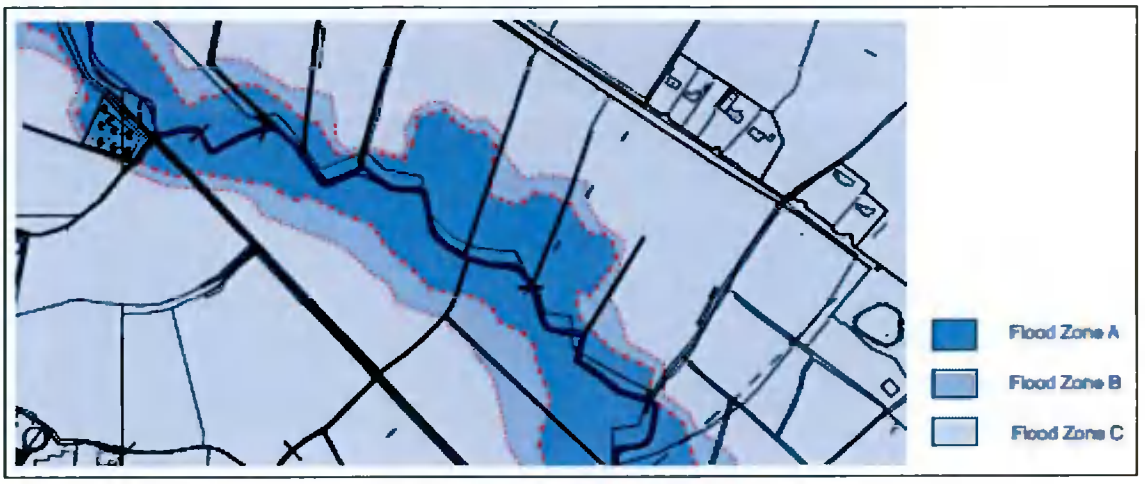
Return period (years)	Annual exceedance probability (%)
2	50
10	10
50	2
100	1
200	0.5
1000	0.1

A.2 Flood Zones

Flood Zones are geographical areas illustrating the probability of flooding. For the purpose of the Planning Guidelines, there are 3 types of levels of flood zones, A, B and C.

Zone	Description
Flood Zone A	Where the probability of flooding is highest, greater than 1% (1 in 100) from river flooding or 0.5% (1 in 200) for coastal/ tidal Flooding
Flood Zone B	Moderate probability of flooding, between 1% and 0.1% from rivers and between 0.5% and 0.1% from coastal/ tidal.
Flood Zone C	Lowest probability of flooding, les than 0.1% from both rivers and coastal/ tidal.

It is important to note that the definition of the flood zones is based on an undefended scenario and does not take into account the presence of flood protection structures such as flood walls or embankments. This is to allow for the fact that there is a residual risk of flooding behind the defences will be maintained in perpetuity.



A.3 Consequences of Flooding

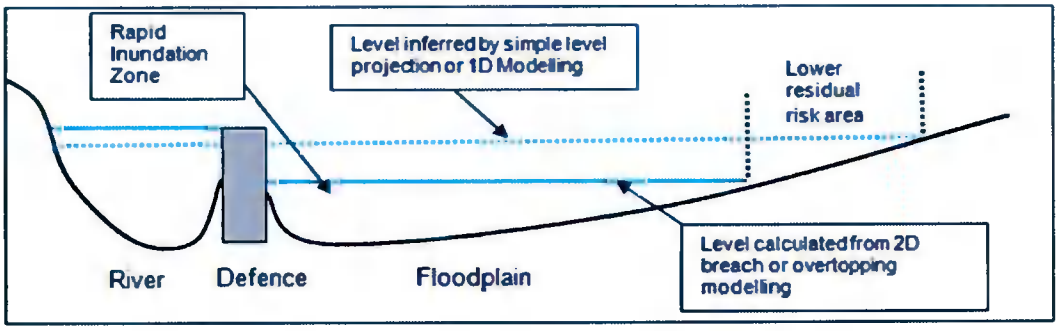
Consequences of flooding depend on the Hazards caused by flooding (depth of water, speed of flow. Rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure of the population, presence and reliability of mitigation measures etc.)

The 'Planning System and Flood Risk Management' provides three vulnerability categories, based on type of development, nature, which are detailed in the Guidelines, and are summarised as:

- **Highly vulnerable**, including residential properties, essential infrastructure and emergency service facilities
- **Less vulnerable**, such as retail and commercial and local transport infrastructure, such as changing rooms.
- **Water compatible**, including open space, outdoor recreation and associated essential infrastructure, such as changing rooms.

A.4 Residual Risk

The presence of flood defences, by their very nature, hinder the movement of flood water across the floodplain and prevent flooding unless river levels rise above the defence crest level or a breach occurs. This known as residual risk:



JBA consulting

Offices at
Dublin
Limerick

Registered Office
24 Grove Island
Corbally
Limerick
Ireland

t: +353 (0) 61 345463
e:info@jbaconsulting.ie

JBA Consulting Engineers and Scientists Limited
Registration number 444752

JBA Group Ltd is certified to:
ISO 9001:2015
ISO 14001:2015
OHSAS 18001:2007

New Civil Engineer 100 COMPANIES OF THE YEAR 2016 WINNER

New Civil Engineer 100 2016 RANKED COMPANY

CHAS Accredited Contractor

Visit our website
www.jbaconsulting.ie