

# Claregalway, Co. Galway Flood Risk Assessment

August 2023

Galway County Council  
County Hall  
Prospect Hill  
GALWAY

# JBA Project Manager

Elizabeth Russell  
 24 Grove Island  
 Corbally  
 Limerick  
 Ireland

## Revision History

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V1 / March 2020	Initial Issue	Galway County Council
V2 / 08/05/2020	Amendment to as built FRS details	Galway County Council
V3 / 08/05/2020	Clarification on flood zones	Galway County Council
V4 / 11/08/2023	Final Report	Galway County Council

## Contract

This report describes work commissioned by Galway County Council and their representative for the contract was Daithi Flood. Fiona Byrne of JBA Consulting carried out this work.

Prepared by ..... Fiona Byrne BSc (Hons) MSc  
 Analyst

Reviewed by ..... Elizabeth Russell BSc MSc CEnv MCIWEM C.WEM  
 Associate Director

## Purpose

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## Contents

1	Introduction .....	1
1.1	Terms of Reference .....	1
1.2	Flood Risk Assessment Aims and Objectives .....	1
1.3	Development Proposal.....	1
1.4	Report Structure.....	1
2	Site Background .....	2
2.1	Location .....	2
2.2	Watercourses.....	2
2.3	Topology .....	2
2.4	Site Geology.....	3
3	Flood Risk Identification.....	6
3.1	Flood History .....	6
3.2	Predictive Flood Mapping.....	8
3.3	Sources of Flooding .....	11
4	Flood Risk and Mitigation .....	12
4.1	Flood Risk.....	12
4.2	Mitigation.....	12
4.3	Residual Risk .....	14
4.4	Proposed Development and Impact on Flood Risk .....	14
5	Conclusion .....	15
	Appendices .....	I
A	Site Layout.....	I
B	Proposed Drainage Layout.....	II
C	Understanding Flood Risk .....	V

## List of Figures

Figure 2-1: Site Location.....	2
Figure 2-2 - Site topography - taken from LIDAR DTM .....	3
Figure 2-3: Subsoils.....	4
Figure 2-4 Groundwater Vulnerability .....	4
Figure 2-5 Site photographs .....	5
Figure 3-1: Floodmaps.ie.....	6
Figure 3-2 Lakeview flooding December 2006 .....	7
Figure 3-3 Lakeview flooding, 2005.....	7
Figure 3-4 Extract from Western CFRAM mapping.....	9
Figure 3-5 Lakeview Turloughs 2005 .....	10
Figure 3-6 Lakeview Turloughs 2009 .....	10
Figure 3-7 Extract of flood map (Source: Clare River Flood Relief Study).....	11
Figure 4-1 Lakeview Pipeline (design drawing).....	13

## Abbreviations

AEP .....	Annual Exceedance Probability
CFRAM .....	Catchment Flood Risk Assessment and Management
DoEHLG.....	Department of the Environment, Heritage and Local Government
EPA .....	Environmental Protection Agency
FRA.....	Flood Risk Assessment
GSI.....	Geological Survey of Ireland
ICPSS .....	Irish Coastal Protection Strategy Study
mbgl .....	Metres below ground level
mOD.....	Meters above Ordnance Datum
OPW .....	Office of Public Works
PFRA .....	Preliminary Flood Risk Assessment
SFRA .....	Strategic Flood Risk Assessment
SI.....	Site Investigation

# 1 Introduction

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

## 1.1 Terms of Reference

JBA Consulting was appointed by Galway County Council to prepare a Flood Risk Assessment (FRA) for the proposed development of a site located at Claregalway, Co. Galway. The report was prepared in response to a request by Daithi Flood of Galway County Council.

## 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 Planning Authority officials and other stakeholders the risk of flooding to land, property and people and the measures that would be recommended to manage the risk.

The objectives of this 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;
- 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 any 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 development is located in Claregalway Village and will comprise of a residential housing estate. The planned site layout is provided in Appendix A.

## 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 mitigation measures are outlined in Section 4, while conclusions are provided in Section 5.

## 2 Site Background

This section describes the proposed residential development site in Claregalway, including watercourses, geology and wider geographical area. A site visit was carried out on 20 March 2020 to allow a greater understanding of the site in the context of its development potential and flood risk.

### 2.1 Location

The proposed development site is located in Claregalway Village, Co. Galway, refer to Figure 2-1. The site is bounded by the residential area Cuairt Na hAbhainn to the north, a GAA pitch to the east and the R381 and further residential areas to the west. It is approximately 500m from the main village of Claregalway and is currently an undeveloped greenfield site.

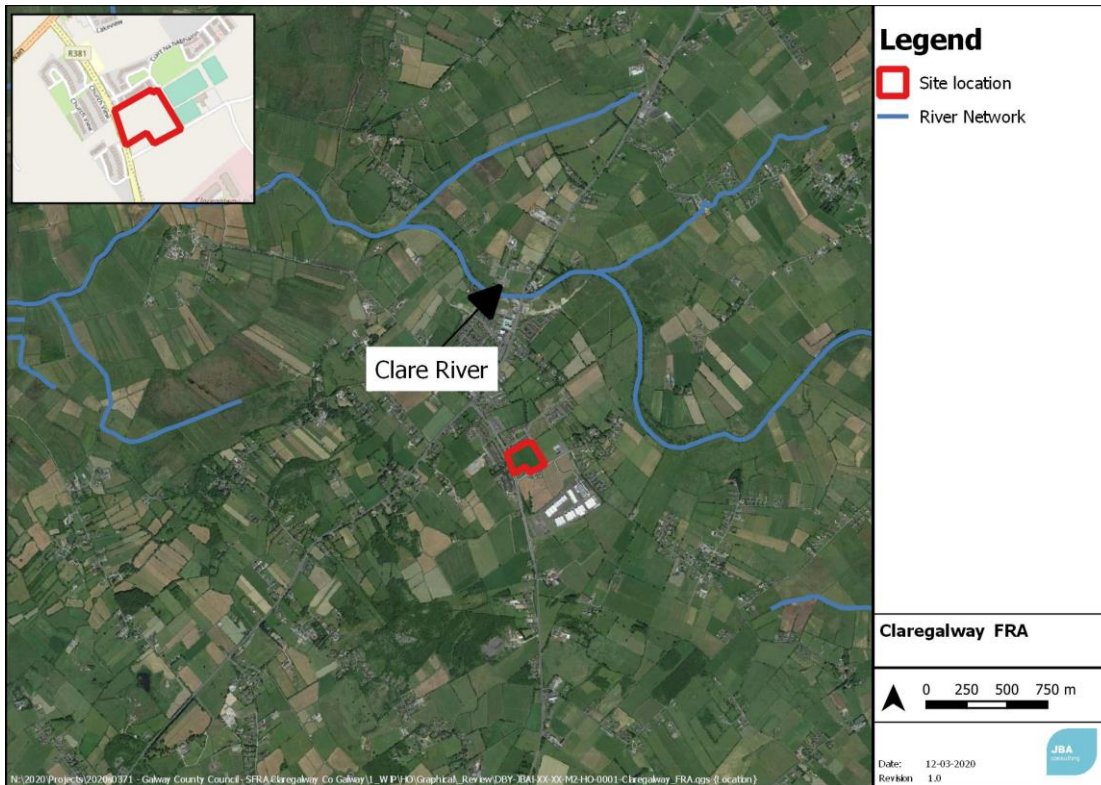


Figure 2-1: Site Location

### 2.2 Watercourses

The main hydrological feature located near the site is the Clare River located approximately 700m to the west of the site.

### 2.3 Topology

The site varies in height with high points of up to 12.66mOD at the road frontage and in a localised high point around the centre of the site (see Figure 2-2). There is a general fall from west to east, with the lowest elevation being approximately 10.5mOD at the north east corner of the site. The site covers an area of c. 2.81ha and is currently a greenfield used for cattle grazing.



Figure 2-2 - Site topography - taken from LIDAR DTM

## 2.4 Site Geology

The groundwater and geological maps of the site, provided by the Geological Survey of Ireland (GSI), have been studied and an extract of the geological map is presented in Figure 2-3. The subsoil is BminDW described as deep well drained mineral (mainly basic).

The underlying bedrock is classified as carboniferous limestone, Burren formation which is described as pale grey clean skeletal limestone.

The associated groundwater vulnerability, which indicates the risk to the underlying groundwater body for the site, is classified as 'High' for the majority of the site, the permeability of the subsoil in the same area is classed as 'Medium'. This implies a depth to bedrock of between 3 and 10m. There is a small section of the which is categorised as "Extreme" vulnerability. This means the depth to bedrock is only between 0 and 3m deep, refer to Figure 2-4.

The GSI maps do not show any karst features in the vicinity of the site, with the nearest karst features being a turlough over 2km to the east and a spring over 2km to the north. There is a borehole or well shown at the property to the southern corner of the site boundary.



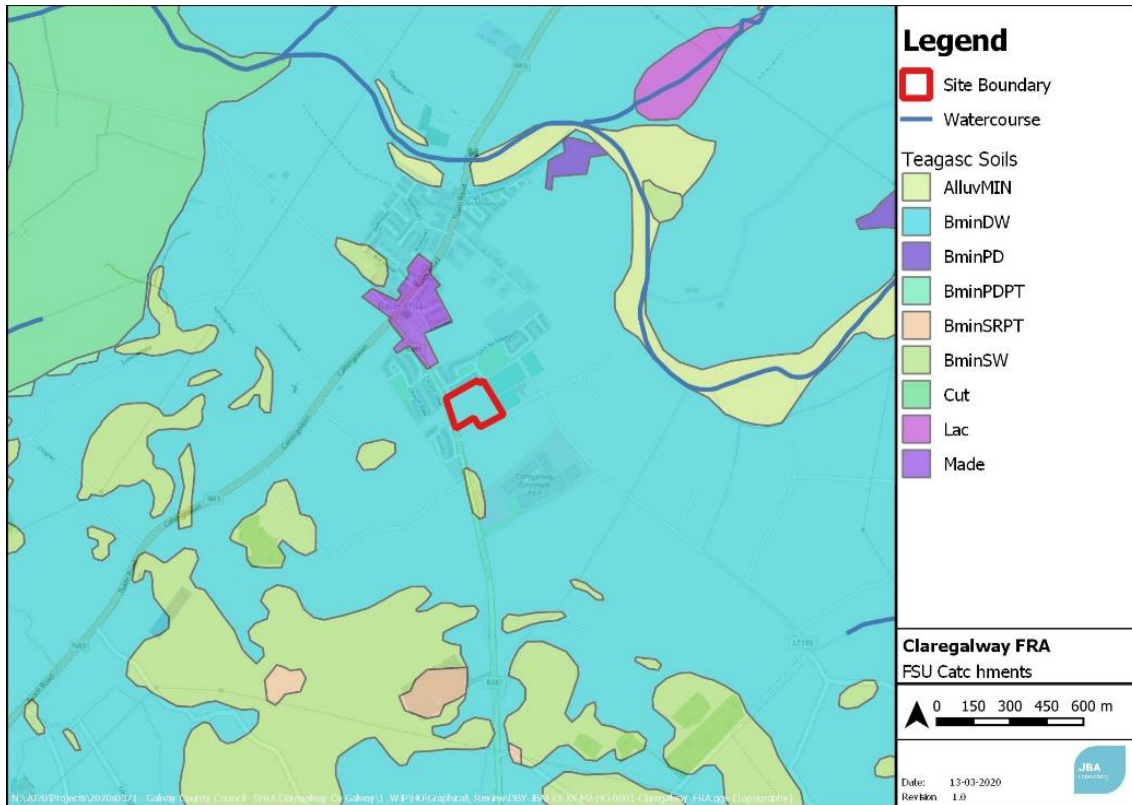


Figure 2-3: Subsoils

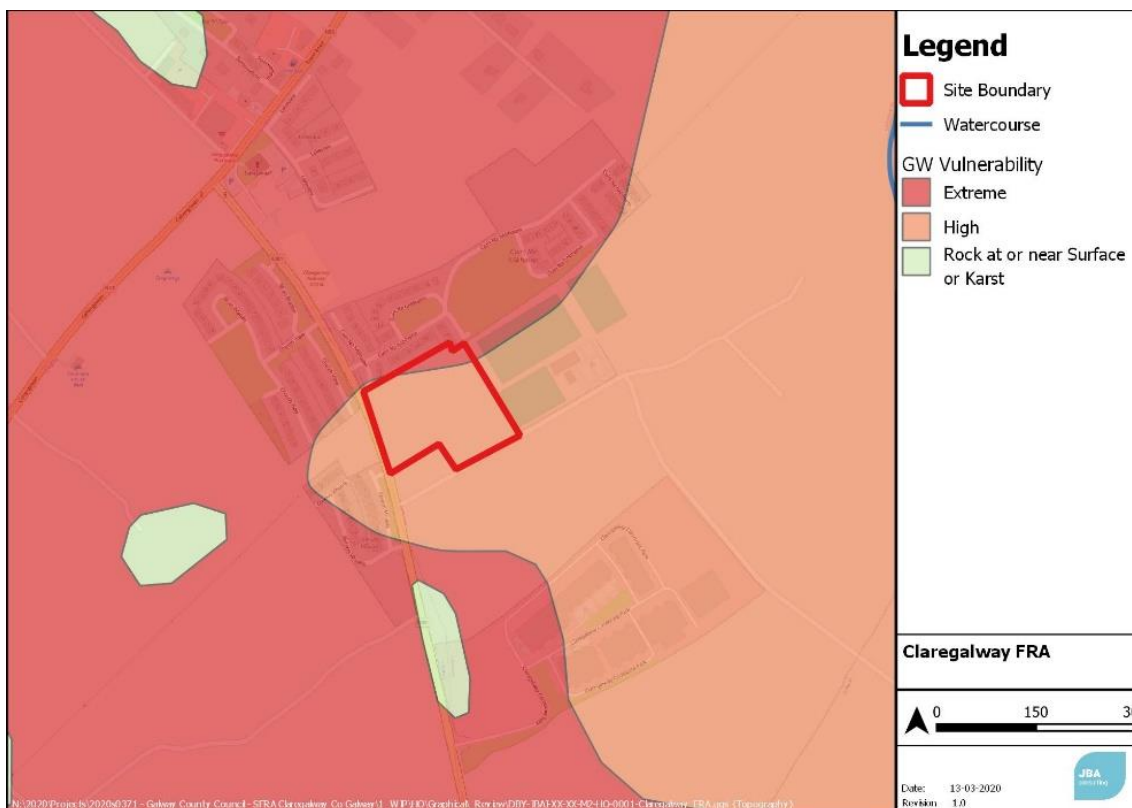


Figure 2-4 Groundwater Vulnerability





From site entrance at R381, looking north



Hedge line across centre of site



Looking north-east towards lowest part of site



Looking south-east, with depression indicated



Eastern site boundary with GAA; access shown is from Cuairt Na hAbhainn to GAA



Looking north-east along route of culverted pipe in Cuairt Na hAbhainn

Figure 2-5 Site photographs

### 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. See Figure 3-1 for historic flood events in the area.

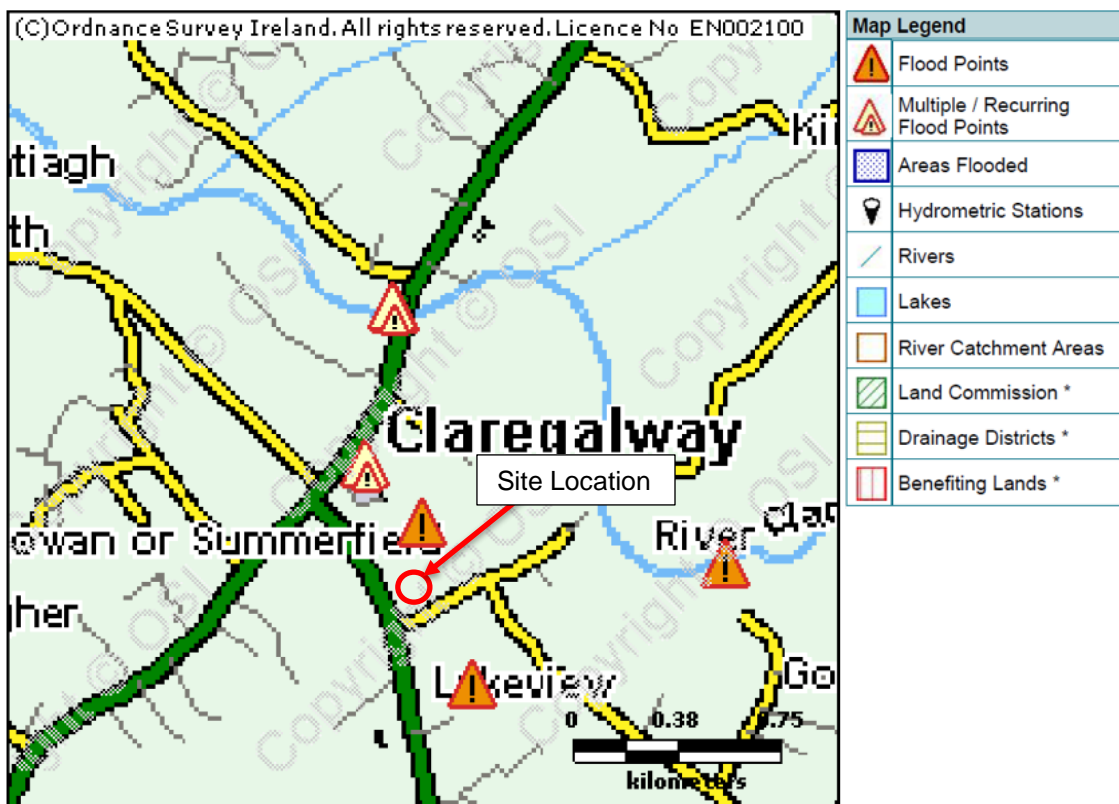


Figure 3-1: Floodmaps.ie

As can be seen in Figure 3-1, several flood events took place in the Claregalway area.

These events include:

Location	Date
Lakeview Estate Claregalway	Recurring
Corrib-Clare Claregalway Galway	01/Feb/1990
Clare Claregalway	29/Nov/1999
Clare River Lissarulla Claregalway	08/Jan/2005
Clare River Lakeview Claregalway	08/Jan/2005
Lakeview	Recurring
Clare River Claregalway Bridge	08/Jan/2005
Flooding at Claregalway	18/Nov/2009



Location	Date
Claregalway area Galway	01/Jan/1991
Clare-Corrib Claregalway	Recurring
Clare Montiagh	Recurring

The events most relevant to the site involve flooding in the Lakeview area. The picture below, provided in a report on floodmaps.ie from the Lakeview residents association, shows the site, which has been added in red, with flooding occurring to the northeast of the site. This can also be seen in Figure 3-3 which shows the northeast corner of the site and the west part of the Cuairt na hAbhainn estate inundated in 2005 as a result of groundwater flooding due to turloughs.



Figure 3-2 Lakeview flooding December 2006



Figure 3-3 Lakeview flooding, 2005

**3.1.2 Internet Search and Anecdotal Evidence**

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 the itself, however several

records of flooding in Claregalway due to the Clare river, and past ground water flooding due to turloughs exist. The residents of Cuirt na hAlbhainn housing estate directly to the northwest of the site recorded flood levels to come within 100mm of FFLs in 2009. Residents of Lakeview estate also reported high levels of water in the area and have photographic records since 1990. Images found via internet searches were included as part of reports found on floodinfo.ie and shown in the previous section.

## 3.2 Predictive Flood Mapping

The area has been a subject to two predicative flood mapping or modelling studies and other related studies:

- OPW Preliminary Flood Risk Analysis;
- Catchment Flood Risk Assessment and Management Study (CFRAM);
- Clare River Flood Relief Scheme

The level of detail presented by each method varies according to the quality of the information used and the approaches involved. The Western 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 Preliminary Flood Risk Analysis

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: 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.

Review of the OPW PFRA study highlights fluvial risk at the proposed site.

### 3.2.2 Western Catchment-based Flood Risk Assessment and Management Study

The primary source of data with which to identify fluvial flood risk is the Eastern Catchment Flood Risk Assessment and Management Study (CFRAM). This study involved detailed hydraulic modelling of the Corrib and the River Clare catchment and its tributaries.

Due to the distance of the site from the coast, tidal flooding from this source has been scoped out. The Western CFRAM identifies the site as being predominantly in Flood Zone C and at low risk of fluvial. There is a small part of the site to the north in Flood Zone B. An extract from the CFRAM mapping can be seen in Figure 3 5. The low point at the northwest of the site correlates with the area of inundation as seen in the mapping below. The topology at the site goes as low as 10.15mOD in this area, with a flood level of 11.76mOD predicted at node 80. However, this patch of flooding is disconnected from the main flood extent and more likely to be a relic of processing than an indication of flood risk.

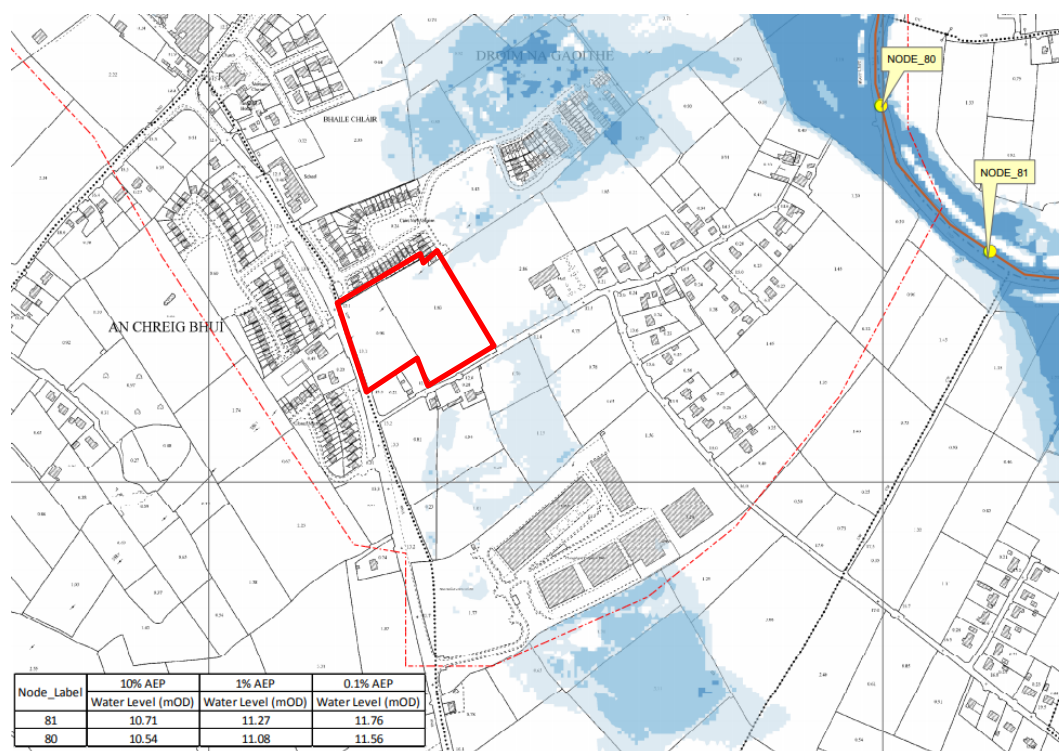


Figure 3-4 Extract from Western CFRAM mapping

### 3.2.3 Clare River Flood Relief Scheme

Due to recurring flood events on the Clare River and its tributary the Abbert River, a study was commissioned to identify measures to provide flood relief in the Claregalway and surrounding areas. The study included development of a hydraulic model and analysis of previous flood events in the area. The study discusses flooding in the Lakeview area and the impact more recent developments had on the area. The contribution of recent developments to flooding in the Lakeview area and throughout the catchment in general was considered to be outside of the scope of the study, however the catchment was examined and measures proposed to alleviate the effects of flooding in the area. Modelled flood levels relevant to the site are shown in Table 3-1.

The report also states that in the Lakeview area flooding appears to be related to turloughs and not from river channel. The Cuirt na hAbhainn housing estate road varies from 10.55mOD to 10.8mOD. Flooding is known to occur in this area during the winter months, particularly when water levels are high in the river. It would appear from the aerial photographs taken in 2009 that the flooding in this area occurs in two separate turloughs, one in the vicinity of the Corporate Park and one in the vicinity of the Cuirt na hAbhainn housing development northwest of the site, refer to Figure 3 5 and Figure 3 6 for labelled image of turloughs close to the site in 2005 and 2009 respectively.

It was ascertained that the turlough at the corporate park, south of the development site, is higher than the turlough closer to the village to the northwest of the site. The higher turlough drains to the lower turlough via a narrow neck located at the GAA pitch. A topographical survey of the area taken for the study suggests that the water level on the 23 November 2009 in the vicinity of the corporate park was c. 11.3mOD, whereas the flood level in the lower turlough was at c. 11.10mOD. The corresponding peak water level in the Clare River at the time is predicted by the model at 11.16mOD at the upstream end of the relevant section and 10.8mOD at the downstream end of the reach. There is no surface water link between the ground water flooding and the river water flooding seen in any photographic evidence.

It can be seen from the images below that the site was partially inundated during both the 2005 and 2009 events. A map of the affected areas in 2009 is shown in Figure 3-6.

Further details of the scheme, which is largely complete, are provided in Section 4.2.



Table 3-1 Modelled flood levels

Location	Scenario	Mean annual flood mOD	Nov 2009 Flood mOD	100 year flood mOD	100 year Flood with CC mOD
Lakeview, Cuirt na hAbhainn	Existing	10.22	11.02	11.36	11.85
Lakeview, Cuirt na hAbhainn	Channel Widening	9.70	10.29	10.51	10.91



Figure 3-5 Lakeview Turloughs 2005



Figure 3-6 Lakeview Turloughs 2009





Figure 3-7 Extract of flood map (Source: Clare River Flood Relief Study)

### 3.3 Sources of Flooding

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

The CFRAM modelling suggests that the site is predominantly in Flood Zone C with a small area in the northwest of the site located in Flood Zone B. This area of flooding is disconnected from the river and more likely to be a processing artefact than an indication of fluvial risk. The Clare River Flood Relief Study also suggests that the risk of flooding by fluvial sources is low.

#### 3.3.2 Pluvial

Pluvial, or surface water, flooding is the result of rainfall-generated flows that arise before run-off can enter a watercourse or sewer. The OPW PFRA mapping shows the central, low-lying, part of the site may act as a collection point for rainfall.

Pluvial flooding could be a risk to the site combined with groundwater flooding due to hardstanding ground lain over turloughs to the south and northwest of the site. Increased hard standing ground can pose a risk of pluvial flooding at the site.

#### 3.3.3 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. Groundwater flooding has been identified as the primary risk to the site. The site is located at an area with high groundwater vulnerability which implies a depth to bedrock of between 3 and 10m. Directly north of the site the groundwater vulnerability is classed as extreme which implies a depth to bedrock of less than 3m. Low depths to bedrock can increase the risk of high groundwater levels and flooding. Previous flooding at the site has been identified as groundwater flooding due to turloughs located to the northwest and south of the site.

## 4 Flood Risk and Mitigation

### 4.1 Flood Risk

From reviewing the available sources of flooding history outlined in Section 3, there is historic evidence of groundwater flooding at the site, but no historic evidence of fluvial risk. Following review of the available information, the site is classified being located in Flood Zone C therefore, the proposed works to the site are in agreement with "The Planning System and Flood Risk Management" guidance. The Flood Zones do not include the effects of other forms of flooding such as from groundwater or artificial drainage systems.

Floodmaps.ie and the Clare River Flood Relief Study identify a risk to the site in the form of groundwater flooding at the proposed development. Measures were undertaken as part of the Clare River Flood Relief Study to alleviate groundwater flood levels in the area and are discussed in the following sections. Potential residual flood risk will also be discussed further in the following sections.

### 4.2 Mitigation

#### 4.2.1 River Clare Flood Relief Scheme

Given the risk of groundwater flooding to the site, careful consideration of inundation depths and the design of mitigation to the development is required. A key factor governing the future operation of the site is that the Clare River FRS will provide flood mitigation to the site. It is noted that no existing or residual fluvial flood risk is present to the site, therefore mitigation measures will focus on potential pluvial and groundwater flooding. Groundwater Flood Risk\Surface Water Flood Risk (Clare River Flood Relief Scheme).

Historic groundwater flooding was recorded at the site on floodmaps.ie and in the Clare Flood Relief Study. There are turloughs present to the northwest and the south of the site at Cuirt na hAbhainn and the Corporate Park respectively. These turloughs tend to fill at time of high rainfall and when water levels on the Clare River are high. An indicative route for Measure 6, the flood relief pipeline, is shown in Figure 4 1, showing a 1.65km, 1050mm diameter surface water outfall pipeline between Claregalway Corporate Park and the Clare River, upstream of the Claregalway Bridge. This was designed to reduce the impact of flooding in areas affected by groundwater flooding. Although only a design drawing, the scheme as built was similar, and any changes have not impacted fundamentally on the flood protection offered, which is 1% AEP and an additional allowance of 20% for climate change.

Measures 4a and 4b relate to widening of the channel and the addition of a flood eye to the bridge in Claregalway. These measures should also benefit surface water drainage in the Lakeview and surrounding areas due to outfalls to the Clare River being able to discharge due to lower water levels.

All elements of the scheme relevant to the function of flood defence in Claregalway have been completed at the time of writing this report, with the Lakeview pipeline completed in about 2018.

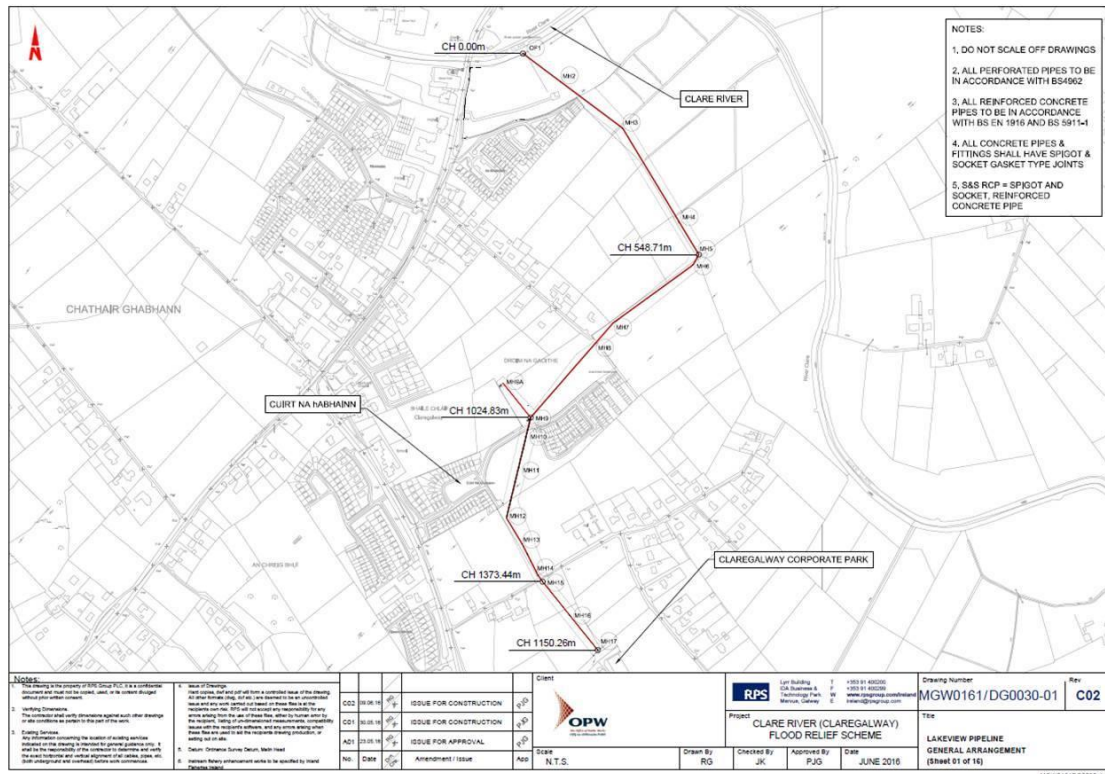


Figure 4-1 Lakeview Pipeline (design drawing)

#### 4.2.2 Surface Water Drainage

A dedicated storm water drainage system will be provided for the development and will pick up surface water run-off from impermeable surfaces such as roadways, footways, and roofs. Precast concrete gullies including lockable cast iron grating and frame connected to a piped system will be provided to collect run-off from these areas. The proposed pipe diameter will range between 225mm and 375mm and will be laid at gradients varying between 1/40 and 1/200.

The proposed storm water drainage system has been designed to cater for all surface water runoff from all hard surfaces within the proposed development including roadways, roofs, parking areas etc. The storm water drainage services have been designed to take account of the requirements of the Department of Environment “Recommendation for Site Development Works for Housing Areas” 1998 and “Sewers for Adoption” published by WRC, UK. All soak ways are designed to accommodate a 1 in 100-year storm event + 20% for Climate Change throughout the site.

The storm drainage for the development was designed in accordance with the Recommendations for Site Development Works for Housing Areas and also the recommendations of the Greater Dublin Strategic Drainage Study (GSDSDS).

The proposed drainage layout drawings can be seen in Appendix B.

#### 4.2.3 Finished Floor Levels

Finished Floor Levels for the site should be set to 1% AEP event levels, including a freeboard of 300mm. The minimum design FFL has been recommended as 11.38m OD and represents a freeboard of 300mm above the Western CFRAM 1% AEP flood level of 11.08mOD on the Clare River. Climate Change has not been a direct consideration when setting the FFL, this is because the site will be protected under the Clare River flood relief scheme. The actual minimum FFL is 11.40mOD (in Block VII) all other blocks are higher.

The recommended FFL also lies above water levels as estimated at the Corporate Park during the 2009 event relating to groundwater flooding therefore providing protection against both fluvial and groundwater flood risks. This would require some infilling across the northwest section of the site and in some localised areas, but most of the site is already above this level.

### 4.3 Residual Risk

Residual risks are defined as risks that remain after all risk avoidance, substitution and mitigation measures have been taken. The flood risk assessment identifies two main sources of residual risk to the proposed development which are as follows:

- Failure of designed stormwater system (pluvial flooding risk)
- Failure of Lakeview pipeline

The primary residual risk to the site since the flood relief scheme has been completed will be failure of the Lakeview pipeline, either through blockage of exceedance flows. The pipeline is predominantly culverted and there are no open channels at the site so risk of overflow to the site itself is low. In the case of failure at the Corporate Park, the risk is managed by suitably high FFLs.

The widening of the channel reduces risk of fluvial flooding and surface water flooding in that routes to outfalls to the Clare River do not get backed up in times of high rainfall. The risk of outfalls blocking or backing up, is again managed by the suitably high finished floor levels

### 4.4 Proposed Development and Impact on Flood Risk

The proposed development will result in a small loss of available floodplain as the footprint of the proposed development will cover some previous areas of flooding. As this is from groundwater, loss of storage is less important than in a fluvial situation. In addition, the impact of the development has been negated by the construction of the flood relief scheme for Clare River.

## 5 Conclusion

JBA Consulting has undertaken a flood risk assessment for the proposed residential development at Claregalway, Co. Galway. The site is within Flood Zone C for fluvial and tidal influences, but at risk of flooding due to groundwater sources. Although a small part of the site is shown as Flood Zone B in the CFRAM, it is concluded that this is a map processing artefact and not an actual indicator of flood risk.

The land is zoned for residential under the current Galway County Development Plan 2015-2021. A factor governing the future operation of the site is that the Clare River Flood Relief Scheme will directly protect the site from ground water flooding. On this basis is, the entire site can be developed for a balanced and sustainable residential development.

A number of factors have been drawn together and used to establish a design strategy for flood risk management:

The design FFL has been recommended as 11.38mOD and represents a freeboard of 300mm above the Western CFRAM 1% AEP flood level on the Clare River. Furthermore, the proposed development will not increase risk to the surrounding area.

The site mitigation and management measures presented in this FRA have considered both the existing risk status and the future defended status and has presented measures that are flexible and robust enough to deal with uncertainty and risk both pre and post- flood relief scheme.

It is concluded that the site is in compliance with the core principles of the Planning System and Flood Risk Management Guidelines and has been subject to a commensurate assessment of risk. It is a suitable site for a residential masterplanning strategy.



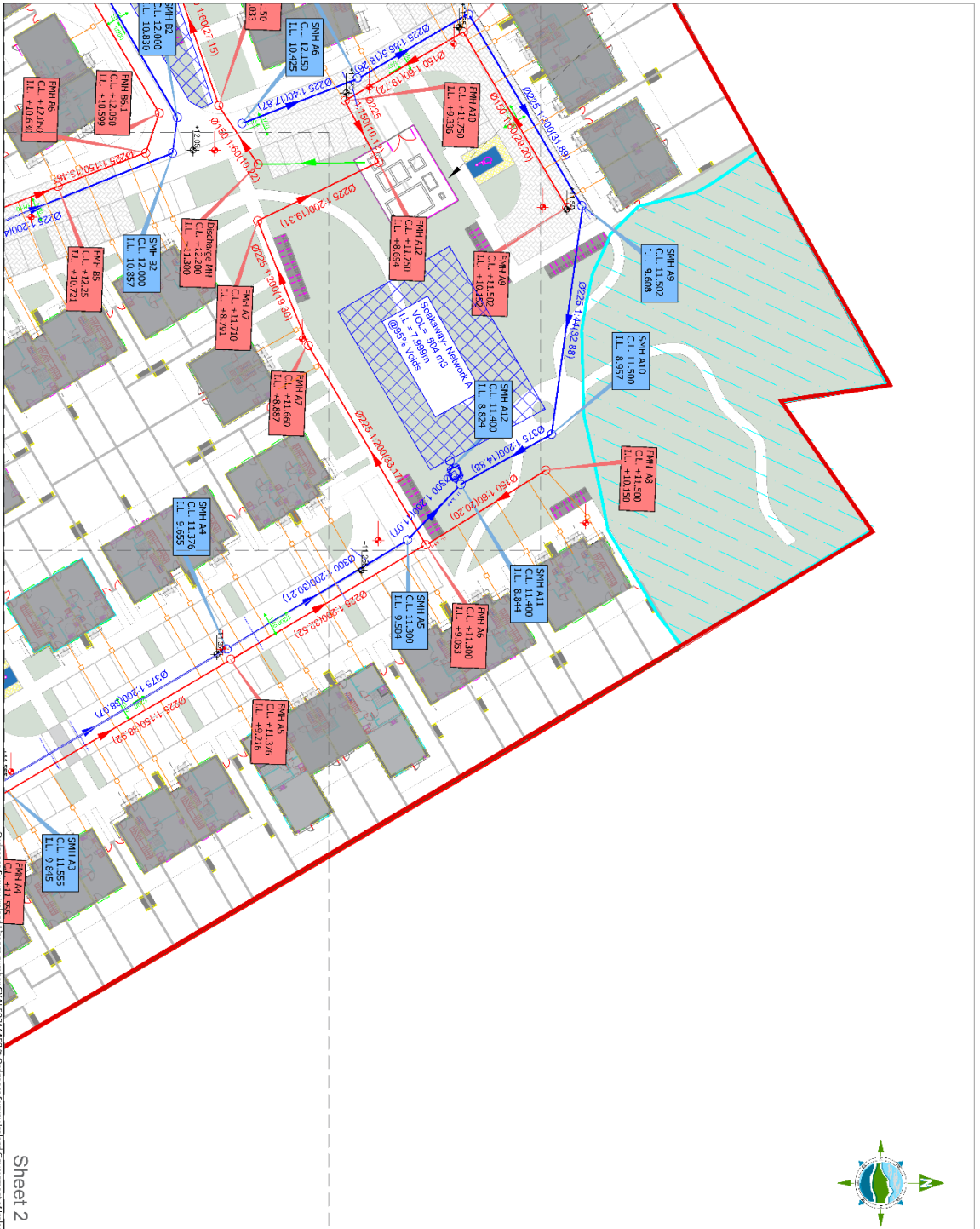
# Appendices

## A Site Layout









Orange Survey/Field Licence number CA13631113 © Orange Survey Ireland Government of Ireland

Sheet 2

THE INFORMATION ON THIS DRAWING IS TO BE USED IN ACCORDANCE WITH THE IRISH COORDINATE SYSTEM



**Legend**

- SM Building
- Proposed Full Gravity Sewer
- Proposed Storm Drainage Sewer
- Proposed Flood Defense
- Proposed Flood Defense
- Proposed Storm Drainage
- Existing Sewer
- Proposed Flowing Water
- Proposed Sewer
- Proposed Manhole
- Proposed Manhole
- Proposed Water Treatment
- Proposed Water Treatment
- Proposed Sewer
- Proposed Sewer

**NOTES:**

1. EXISTING SEWERAGE SYSTEMS ARE SHOWN IN RED.
2. PROPOSED FULL GRAVITY SEWERAGE IS SHOWN IN BLUE.
3. PROPOSED STORM DRAINAGE IS SHOWN IN GREEN.
4. PROPOSED FLOOD DEFENSE IS SHOWN IN ORANGE.
5. PROPOSED FLOOD DEFENSE IS SHOWN IN ORANGE.
6. PROPOSED FLOOD DEFENSE IS SHOWN IN ORANGE.
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10. PROPOSED FLOOD DEFENSE IS SHOWN IN ORANGE.

No	Description	Date

Client: Galway County Council

Project: Proposed Residential Development Ballymoinagh, Clontarf

Site: Proposed Drainage Layout (Sheet 2 of 3)

Scale: 1:250

Author: **TOBIN**

Project: Ballymoinagh Residential Development

Site: Ballymoinagh, Clontarf

Scale: 1:250

Date: 11/17/2005

Client: Galway County Council

Contact: 11171-2005D01

11171-2005D01



## C 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:

$$\text{Flood Risk} = \text{Probability of Flooding} \times \text{Consequences of Flooding}$$

### C.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 (in years). A 1% AEP flood has a 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 be 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.

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

Table: Conversion between return periods and annual exceedance probabilities

### C.2 Flood Zones

Flood Zones are geographical areas illustrating the probability of flooding. For the purposes of the Planning Guidelines, there are 3 types or 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; less 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 due to overtopping or breach and that there may be no guarantee that the defences will be maintained in perpetuity.





Indicative Flood Zones (OPW & DoEHLG 2009)

### C.3 Consequence 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 the type of development, which are detailed in Table 3.1 of 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;
- Water compatible, including open space, outdoor recreation and associated essential infrastructure, such as changing rooms.

**JBA**  
consulting

Offices at

Dublin

Limerick

Registered Office

24 Grove Island

Corbally

Limerick

Ireland

t: +353 (0) 61 345463

e: [info@jbaconsulting.ie](mailto:info@jbaconsulting.ie)

**JBA Consulting Engineers and  
Scientists Limited**

Registration number 444752

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