John Street, New Ross Flood Risk Assessment

January 2024

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Prepared by	Ashling Laffey BSc (Hons) Assistant Analyst
Reviewed by	Orla Hannon BSc (Hons) Analyst Ross Bryant BSc MSc CEnv MCIWEM C.WEM Associate Director
Authorised by	Ross Bryant BSc MSc CEnv MCIWEM C.WEM Associate Director

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Contract

JBA Project Manager	Ross Bryant
Address	24 Grove Island, Corbally, Limerick
JBA Project Code	2023s1386

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Abbreviation

AEP	Annual Exceedance Probability
AFA	Area for Further Assessment
CFRAM	Catchment Flood Risk Assessment and Management
DoHELG	Department of the Environment, Heritage and Local Government
DTM	Digital Terrain Model
FB	Freeboard
FFL	Finish Floor Levels
FRA	Flood Risk Assessment
FSR	Flood Studies Report
GSI	Geological Survey of Ireland
LiDAR	Light Detection and Ranging
NIFM	National Indicative Fluvial Mapping
OPW	Office of Public Works
PFRA	Preliminary Flood Risk Assessment
RR	Rainfall-Runoff
RMS	Root Mean Square
SAAR	Standard Average Annual Rainfall (mm)
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Urban Drainage System
WCDP	Wexford County Development Plan
WL	Water Level

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 (FRA) to ensure sustainability and effective management of flood risk.

1.1 Terms of Reference

JBA Consulting was appointed by Wexford County Council to prepare an FRA for the proposed development of a grain store in John St, New Ross. The potential work will confirm the existing flood risk to the site and ensure that an appropriate design is configured for the site that complies with the relevant Planning Guidelines for Flood Risk Management under the Part VII application.

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 an 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 client is submitting a Part 8 application for alterations, extensions & external works to The Grain Store, John’s Street, New Ross, Wexford (A protected structure – RPS No. NR0143 – NIAH No. 15605016). The proposed site layout, from the client is displayed in Figure 1-1.

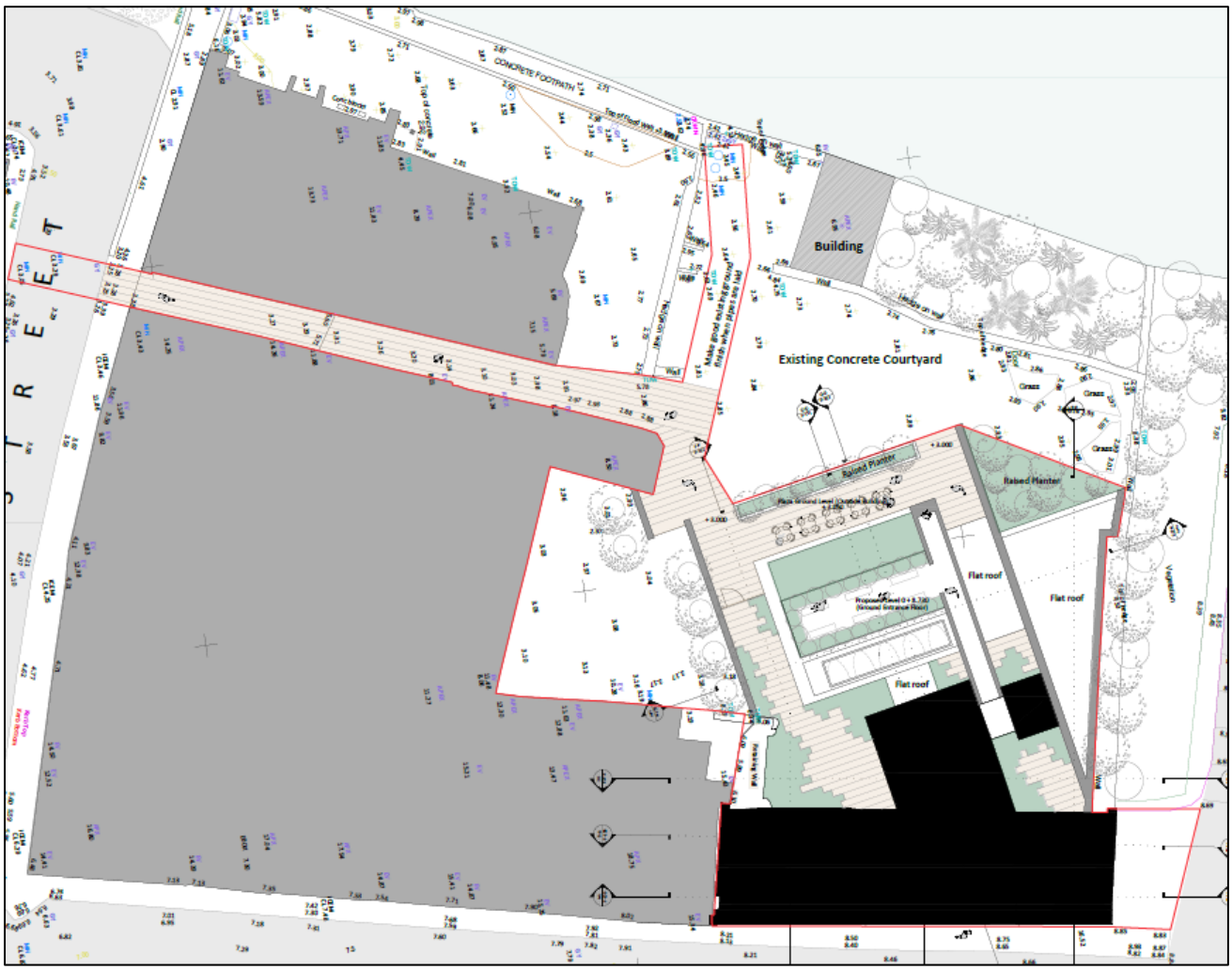


Figure 1-1: Site Layout

1.4 Report Overview

Section 2 of this report gives an overview of the study location and associated watercourses. Section 3 contains background information on flood risk. Section 4 provides initial assessment of flood risk and mitigation measures. A Development Management Justification Test is undertaken in Section 5 while conclusions are provided in Section 6.

2 Site Background

This section describes the proposed development site located in John St, New Ross, Co. Wexford, including watercourses, geology, and wider geographical area.

2.1 Location

The proposed development site is located in the town of New Ross on the eastern side of the River Barrow, refer to Figure 2-1 below. The profile of the site is generally flat with a slight downward slope towards the River Barrow. The site contains a former grain store which is accessed via John Street.

The site is bounded by the following:

- Car park to the north
- Retail and residential buildings to the south
- John Street to the east
- River Barrow to the west

Due to the extensive flood history in the town, flood defence schemes have been carried out in the last 15 years to help reduce damage to properties and roads. An interim flood defence scheme was completed in 2009 and has now been incorporated into a much larger defence scheme which is complete. The new defence extends 2.2km, runs along both banks of the River Barrow and includes demountable barriers, concrete walls and embankments. The indicative alignment of the flood wall adjacent to the site is shown in Figure 2-1. The food wall stops at the site boundary and leads into a masonry wall that continues along the rest of the boundary, therefore the site does not benefit from the flood defence.

2.2 Watercourses

The site is located on the left bank of the River Barrow, as seen in Figure 2-1. The River Barrow is 192km long and has a catchment area of 3,067m^2.

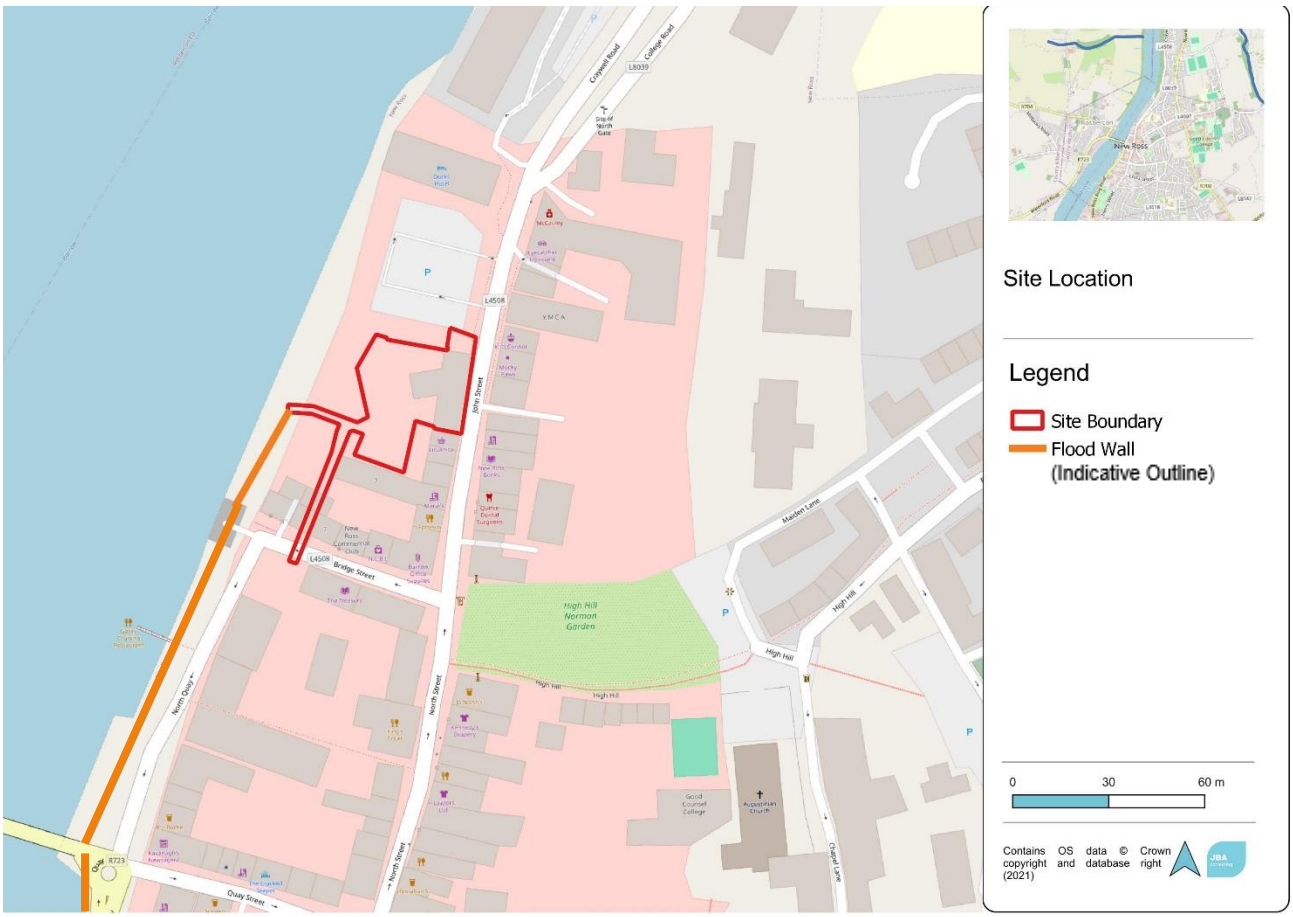


Figure 2-1:Site Location

2.3 Site Geology

The groundwater and geological maps of the site, provided by the Geological Survey of Ireland (GSI), have been studied. The subsoil is urban. The underlying rock formation is the Ballylane Shale Formation and the Oaklands Formation, which consists of green, red-purple, buff slate, siltstone and green and grey slate with thin siltstone

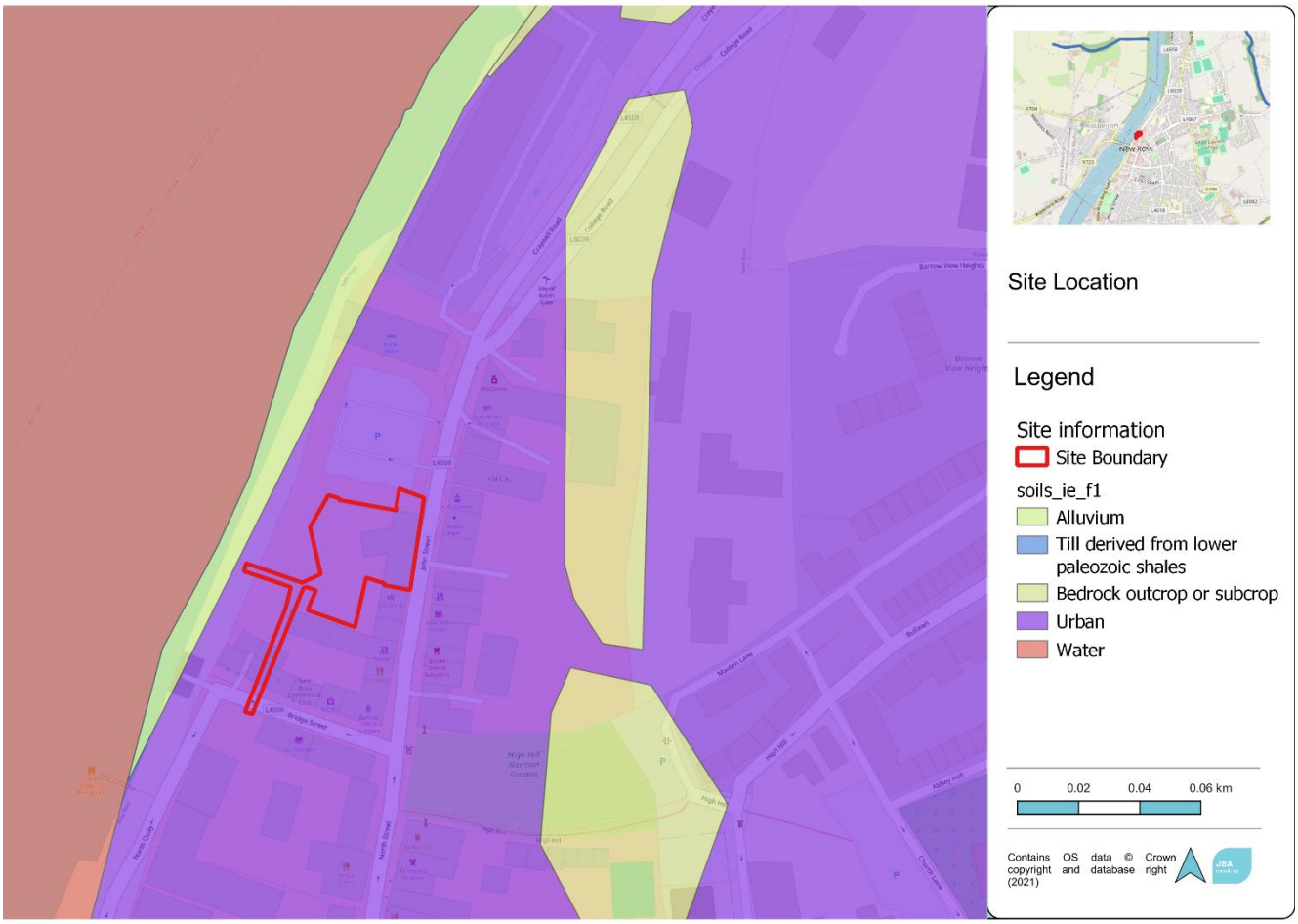


Figure 2-2: Quaternary Sediments Map

2.4 Local Groundwater Vulnerability

The GSI groundwater vulnerability maps were available for review. The groundwater vulnerability on site has been classified as 'High' to 'Extreme', meaning there is a high to extreme risk to the groundwater. There were no areas of surface water flooding from the Winter 2015 / 2016 flood event identified on site. The Winter 2015 / 2016 Surface Water Flooding mapping shows fluvial (rivers) and pluvial (rain) floods during the Winter 2015 / 2016 flood event and was developed as a by-product of the historic groundwater flood map. There were no historic or predictive groundwater flood extents identified on site or nearby.

2.5 Local Topography

A review of the LiDAR levels, courtesy of the Geological Survey Ireland (GSI) and Office of Public Works (OPW) show that there is a general east-west fall across the site. The LiDAR reviewed was the OPW NASC Digital Terrain Model (DTM) LiDAR, which has a resolution of 2, and an RMS error within +/- 200mm. The data was captured in 2011. Refer to Figure 2-3.

Topographic survey completed for the site indicates site levels fall from 8.89mOD (boundary with John Street to east) to 2.45mOD (boundary with River Barrow).

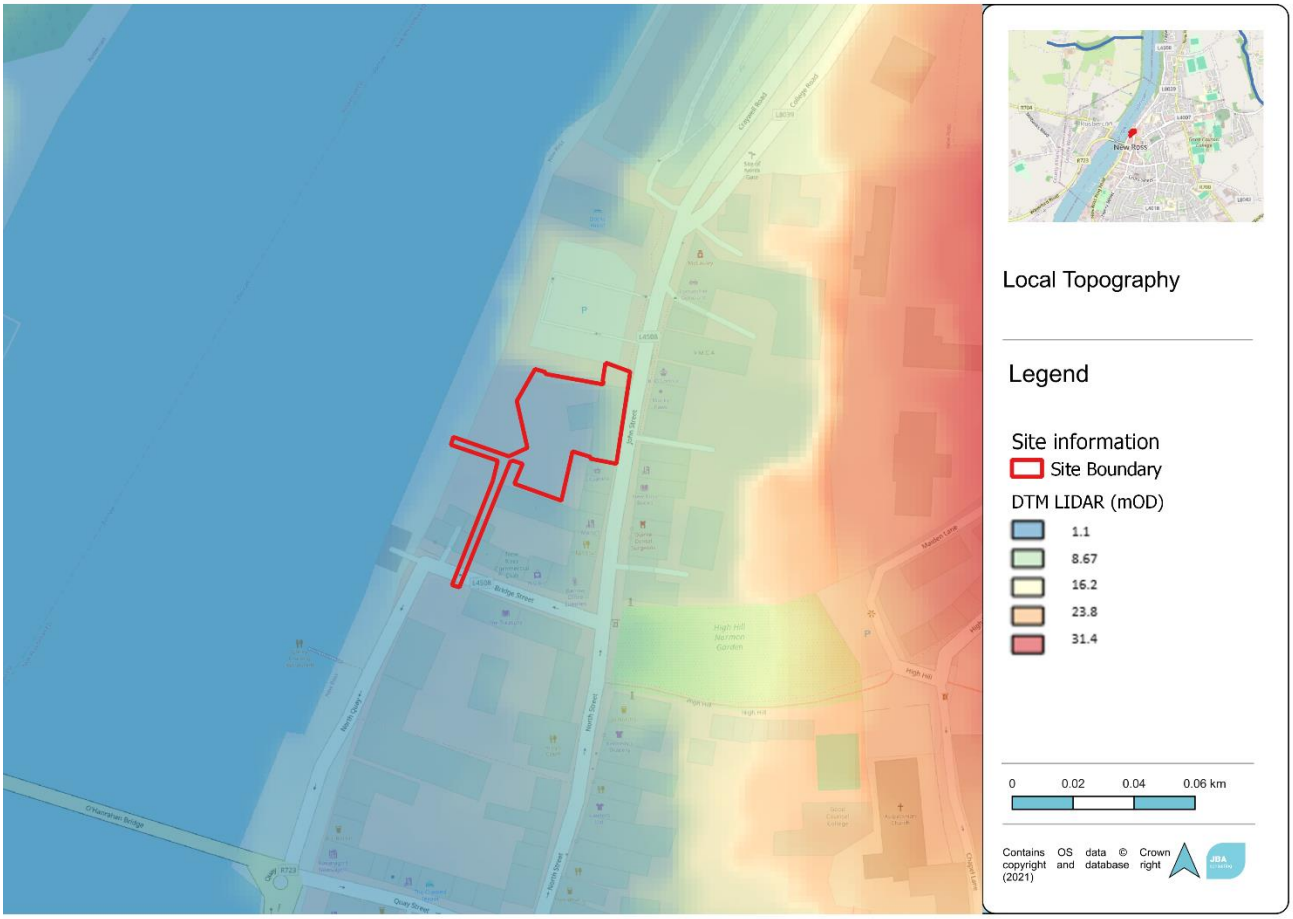


Figure 2-3: Local Topography.

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 historical flood information. The findings from the flood risk identification stage of the assessment are provided in the following sections. Further detail on the Planning Guidelines and technical concepts are provided in Appendix A.

3.1 Flood History

A number of sources of flood information have been reviewed to establish any recorded flood history at, or near the site. This includes the OPWs national flood information portal, www.floodinfo.ie, and general internet searches.

3.1.1 Floodinfo.ie

The OPW have established a National Flood Risk Hazard Mapping website, www.floodinfo.ie, which highlights areas at flood risk through the collection of recorded data and observed flood events. The website provides significant national data that there are multiple reports of flooding within the site location.

- Flood ID-12170: report of flooding at New Ross Co. Wexford on 6th January 2014. Reported as a result of tidal flooding. It is not clear whether or not the site was impacted as a result of this flood event.
- Flood ID-4819: Information on flooding in Co. Wexford in October 2001. Report states that "very high tides resulted in flooding to a depth of some 300mm along the quays including the N25". The N25 is located 6.5km downstream from the site location. It is not clear whether or not the site was impacted as a result of this flood event.
- Flood ID-3006: Barrow New Ross Quay recurring river flooding caused by high tides, strong winds and rainfall. Flood event in February 2002 occurred due to extremely severe southerly winds with gusts in excess of 100km/hr which coincided with a predicted highest tide for the month of 4.53m. There was damage to a number of commercial sites along the quays. Flood event in October 2004 occurred from high tides resulting in flooding to a depth of some 300mm along the quays including the N25. Some properties were damaged, however the use by many properties of 'flobars' to dam their doorways minimised damage. It is not clear whether or not the site was impacted as a result of this flood event.

Figure 3-1: Past Flood Event Points

3.1.2 Internet Searches

An internet search was conducted to gather information about whether the site was affected by flooding previously. A number of news reports were available on flooding in the area in September 2022 and February 2014.

In the flood event 15/08/2022[1,2] up to 40mm of rain fell in one hour and was followed by heavy hailstones. Dozens of homes and businesses were damaged in this event. Footage found online shows a mudslide from a park slipping down from High Hill across John Street and on to Bridge Street.

In the flood event 02/02/2014[3] New Ross was hit by a combination of high tides, high winds and heavy rain. Multiple homes and businesses were damaged in this event. Footage found online shows buildings and cars partially submerged in water.

1 Families and businesses in Wexford suffer 'trauma' in flash floods
2 New Ross cleaning up after 'one-in-150-years' freak downpour
3 Counting the cost of more flooding

3.2 Predictive Flood Mapping

The wider area has been a subject to predictive flood mapping or modelling studies and other related studies and plans.

- The Wexford County Development Plan
- South Eastern Catchment Flood Risk Assessment and Management (SE CFRAM) Study
- National Indicative Fluvial Mapping 2021 study

3.2.1 The Wexford County Development Plan

The Wexford County Development Plan (WCDP) has sought to proactively manage flood risk in the county in accordance with the EU Flood Directive 2007/60/EC. A Strategic Flood Risk Assessment for the WCDP 2022-2028 was carried out by JBA Consulting in accordance with the requirements of 'The Planning System and Flood Risk Management - Guidelines for Planning Authorities' (2009). The SFRA provides an assessment of all types of flood risk within the county. Figure 3-2 depicts JBA Consulting Flood Zone Mapping for the New Ross Area, with the site location circled in red.

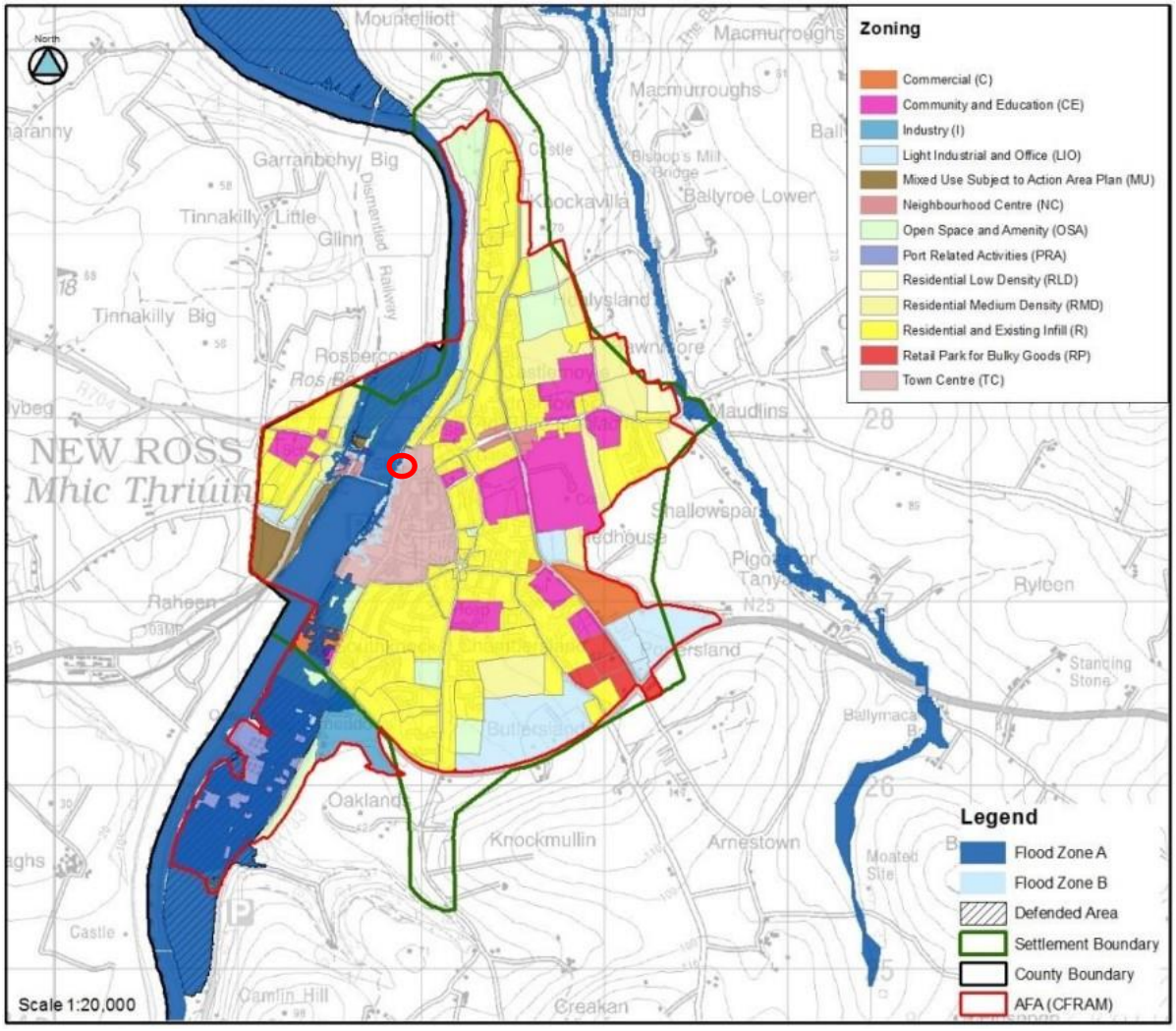


Figure 3-2 Wexford County Council Development Plan SFRA Flood Map

3.2.2 National Indicative Fluvial Mapping 2021 study

The OPW hosts the National Indicative Fluvial Mapping (NIFM) study on the floodinfo.ie portal. This fluvial mapping shows the modelled extent of lands that might be flooded by rivers during a theoretical flood event with an estimated probability of occurrence for watercourses not covered by the CFRAM AFAs. This predictive flood mapping replaces the superseded OPW PFRA study and covers fluvial watercourses with catchments greater than 5 sq.km.

As the flood mapping in the New Ross area is already covered to CFRAM standard, the NIFM mapping has not been considered any further.

3.2.3 South Eastern CFRAM

The South Eastern Catchment Flood Risk Assessment and Management Study (SE CFRAM) commenced in 2011 and was finalised in 2019. The study involves detailed hydraulic modelling of rivers and their tributaries. Within County Wexford, the CFRAM targeted areas of significant flooding, included New Ross. Finalised flood maps for the 10%, 1% and 0.1% AEP are publicly available through the CFRAM Study website. The SE CFRAM study is the most detailed flood mapping study to be carried out in the area. Completed in 2017, both fluvial and coastal flooding were modelled for the Barrow River and surrounding areas.

Figure 3-3 displays an extract from the SE CFRAM fluvial flood maps for New Ross. The western boundary of the site is shown to be at risk from the 1% and 0.1% AEP fluvial flood events. Table 3-1 shows water level results extracted from Eastern CFRAMS (Fluvial), which gives the modelled water levels for the 10% AEP, 1% AEP and the 0.1% AEP events at the model nodes upstream and downstream of the site.

Table 3-1: SE CFRAM Fluvial Flood Events - Current Scenario

	10% AEP Water Level (mOD)	1% AEP Water Level (mOD)	0.1% AEP Water Level (mOD)
14BARO02293	2.53	2.59	2.65
14BARO02251	2.51	2.57	2.62

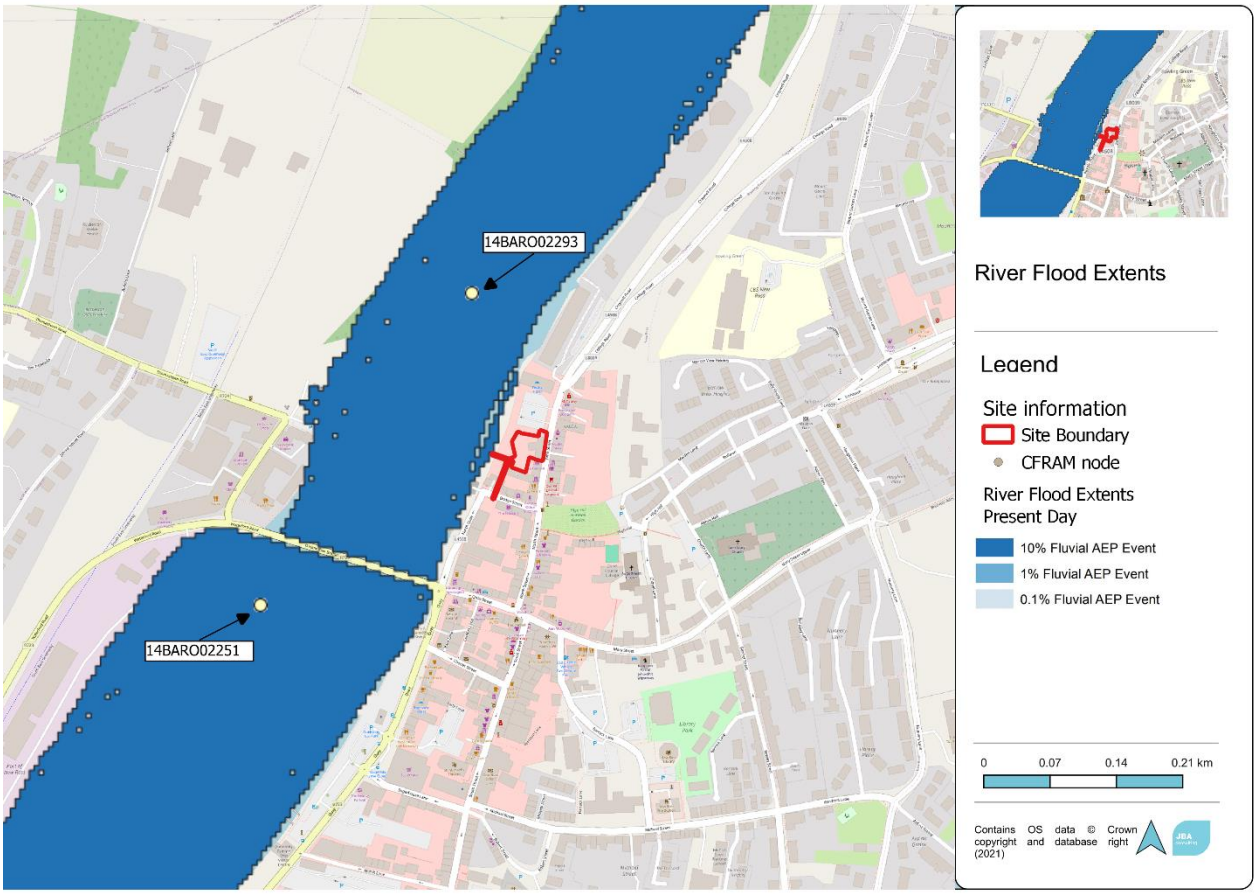


Figure 3-3: SE CFRAM Fluvial Flood Events - Current Scenario

Figure 3-4 displays an extract from the SE CFRAM coastal flood maps for New Ross. The map shows the site to be to risk from the 10%, 0.5% and 0.1% AEP extents. Table 3-2 shows water level results extracted from Eastern CFRAMS which gives the modelled water levels for the 10% AEP, 0.5% AEP and the 0.1% AEP coastal events at the model nodes upstream and downstream of the site. It can be noted that the CFRAM does not include the Flood Relief Scheme (FRS) and so does not represent the defended area (adjacent to the site) correctly. However, the site itself is not defended as part of the FRS so the flood extents at the site are still representative. The CFRAM mapping and estimated flood levels suggest that flood levels and extents are greater in a coastal flood event than a fluvial flood event.

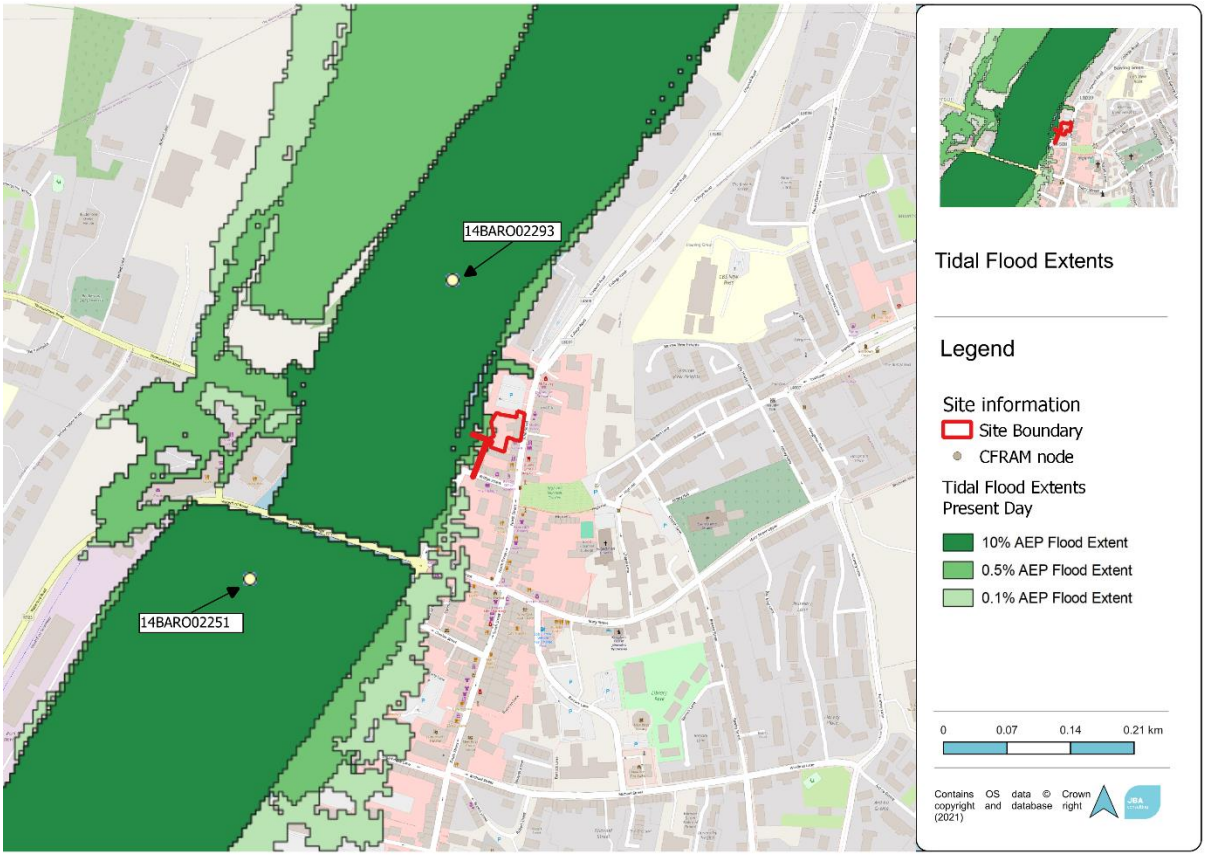


Figure 3-4: SE CFRAM Tidal Flood Extents - Current Scenario

Table 3-2: SE CFRAM Tidal Flood Events - Current Scenario

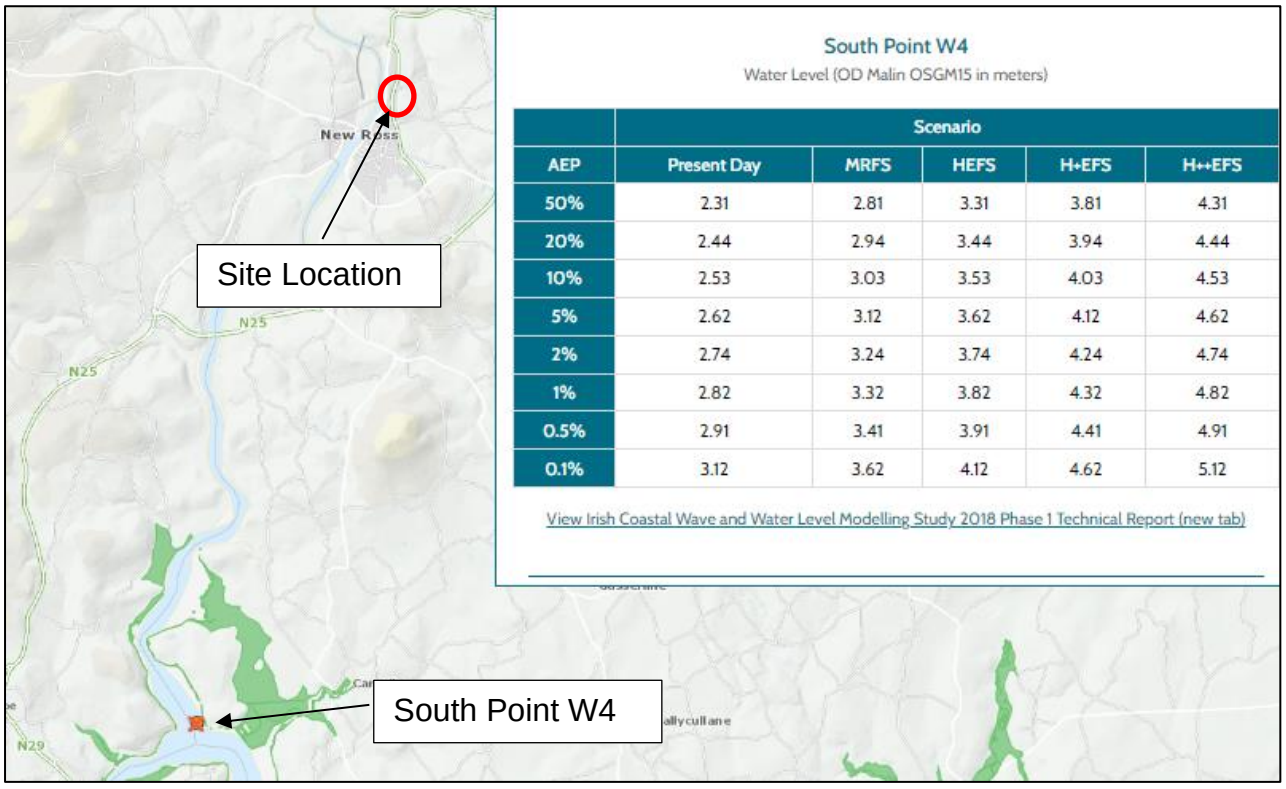
	10% AEP Water Level (mOD)	0.5% AEP Water Level (mOD)	0.1% AEP Water Level (mOD)
14BARO02293	2.64	2.91	3.03
14BARO02251	2.63	2.90	3.01

The CRFRAM tidal flood extents are modelled using the coastal levels from the Irish Coastal Protection Strategy Study (ICPSS) undertaken between 2004 and 2013. Since the CFRAM mapping has been completed, the ICPSS study has been updated using the Irish Coastal Wave and Water Level Modelling Study (ICWWS) which was completed in 2018. The coastal levels in the ICWWS study now supersede the CFRAM coastal flood maps. Refer to Section 3.2.4 below for more information on the ICWWS.

3.2.4 National Coastal Flood Hazard Mapping

The National Coastal Flood Hazard Mapping (NCFHM) was published in 2021 and is based the still water sea levels estimated as part of the Irish Coastal Wave and Water Level Modelling Study (ICWWS). The nearest ICWWS node to the site is W4, refer to Figure 3-5 below. Figure 3-5 also provides the water levels for each of the AEP events at W4. The 0.5% AEP flood level at 2.91mOD and the 0.1% AEP flood event flood levels are 3.12mOD. The Mid Range Future Scenario (MRFS) and High End Future Scenario (HEFS) flood levels are also provided in the table. These are 3.41 and 3.91mOD, respectively, for the 0.5% AEP event.

The NCHFM flood maps were produced as part of the study are shown in Figure 3-6 below. As seen from the figure, part of the site is within Food Zone A and B from coastal sources.



South Point W4

Water Level (OD Malin OSGM15 in meters)

	Scenario				
AEP	Present Day	MRFS	HEFS	H+EFS	H++EFS
50%	2.31	2.81	3.31	3.81	4.31
20%	2.44	2.94	3.44	3.94	4.44
10%	2.53	3.03	3.53	4.03	4.53
5%	2.62	3.12	3.62	4.12	4.62
2%	2.74	3.24	3.74	4.24	4.74
1%	2.82	3.32	3.82	4.32	4.82
0.5%	2.91	3.41	3.91	4.41	4.91
0.1%	3.12	3.62	4.12	4.62	5.12

View Irish Coastal Wave and Water Level Modelling Study 2018 Phase 1 Technical Report (new tab)

Figure 3-5: ICWWS Node and Water Levels

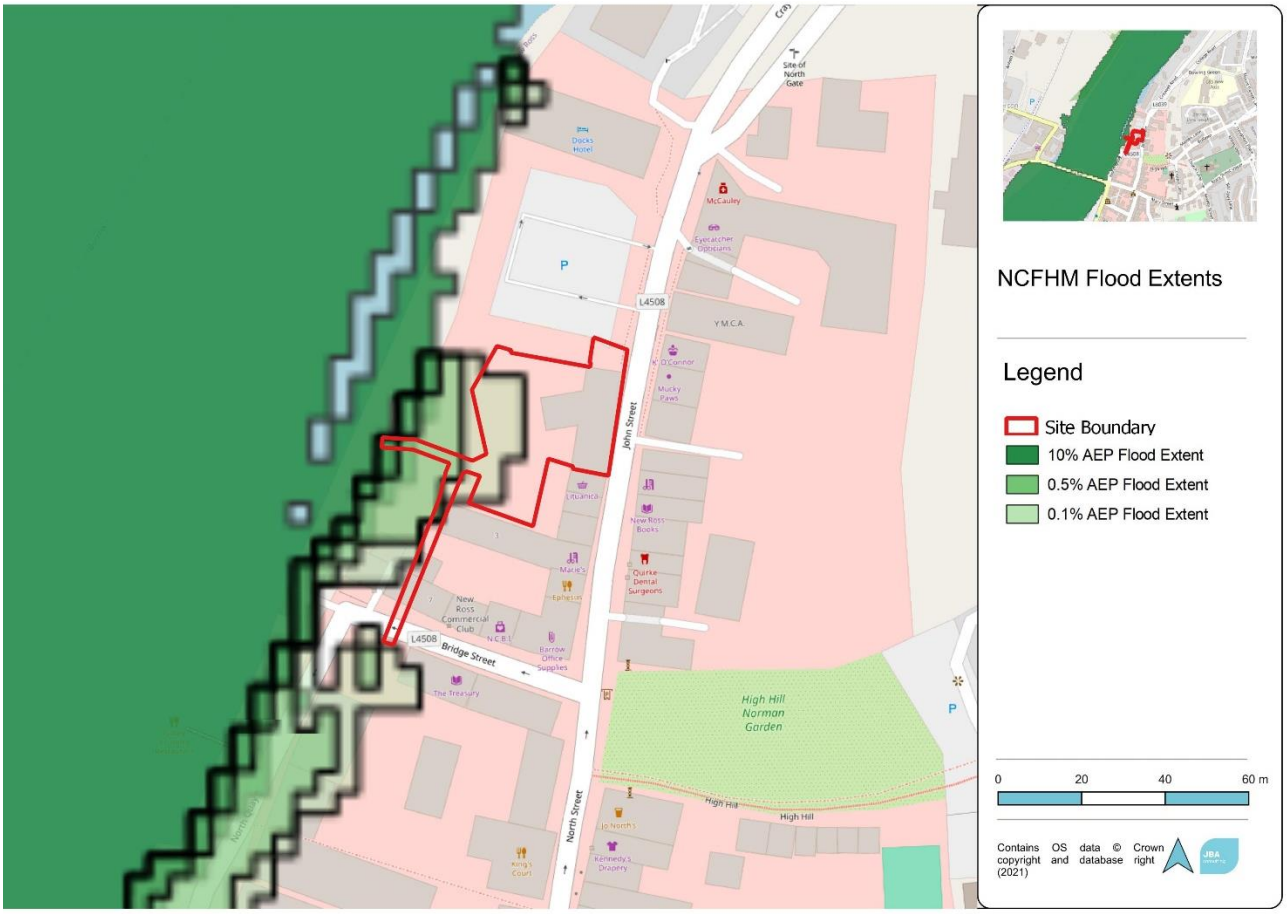


Figure 3-6: NCFHM Flood Maps

While the 0.5% AEP water levels are the same as those in the CFRAM study (based on ICPSS water levels), the 0.1% AEP water levels are approx. 90mm above the estimated levels from the CFRAM study. As the most up to date information the ICWWS/NCFHM should supersede the CFRAM.

3.3 Sources of Flooding

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

3.3.1 Fluvial

The River Barrow is a potential source of flooding. The flood mechanism is controlled by the steady rise in river levels that is driven by long duration rainfall across the wider Barrow catchment. The CFRAM mapping has identified the site as having a moderate to low probability of flooding. However, the fluvial flood risk is secondary to that created by the tide.

3.3.2 Pluvial

Pluvial flooding is the result of rainfall-generated overland flows which arise before run-off can enter any 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. There were no pluvial flood events identified within the site or the immediate vicinity.

3.3.3 Tidal

The primary source of flood risk to the site is tidal flooding. The CFRAM has been superseded by the ICWWS and the NCHFM study. A study of the NCFHM mapping for the area confirms that part of the site is at risk of tidal flooding from the River Barrow during the 0.5% and 0.1% AEP event with flood levels of 2.91 and 3.12mOD, respectively.

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. Although the GSI groundwater vulnerability mapping indicated a high to extreme risk to the groundwater at the site, there is no record of historic groundwater flooding in the area. Similarly, there were no predictive groundwater flooding extents identified on-site or nearby.

4 Flood Risk Assessment

4.1 Flood Risk

The available sources of flooding outlined in Section 3.1 indicate that part of the site has flooded previously in September 2022, February 2014 and October 2004. Section 3.3 of this report confirms that the site is predominantly at risk of tidal flooding and is located partially within Flood Zone A and B.

Figure 4-1 below overlays the tidal flood extents (based on the ICWWS flood levels and ignoring local flood defences) over the site layout using the surveys ground levels on site to estimate the Flood Zones.

Flood Zone A extends to the western and the southern leg of the site which are proposed for open space. Flood Zone B encroaches on the footprint of the building at Level -2. The Ground Floor of the site is at a higher level and links onto John Street, which is in Flood Zone C. Figure 4-2 shows a long section through the site which shows the proposed Levels -2 on a lower level than the Ground Flood leading on the John Street.

Level -2 is proposed for a café/restaurant which is a low vulnerability development. While a low vulnerability development is appropriate in Flood Zone B, given part of the site is in Flood Zone A, the Justification Test (JT) is undertaken in Section 4.3.

Due to the risk of flooding to the site, careful consideration of mitigation options is required, and this is discussed further in Section 4.2 below.

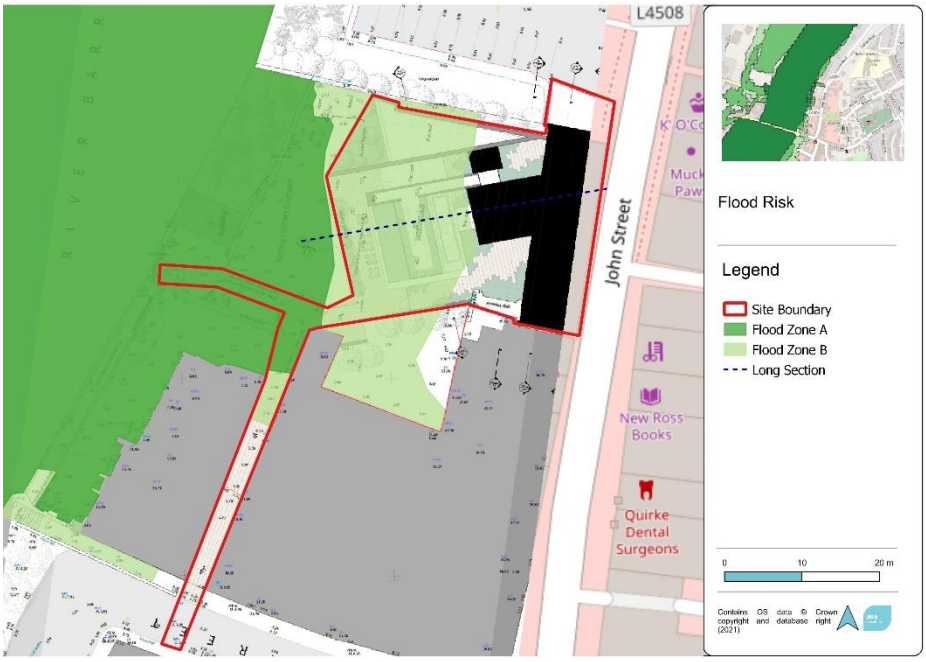


Figure 4-1: Flood Risk

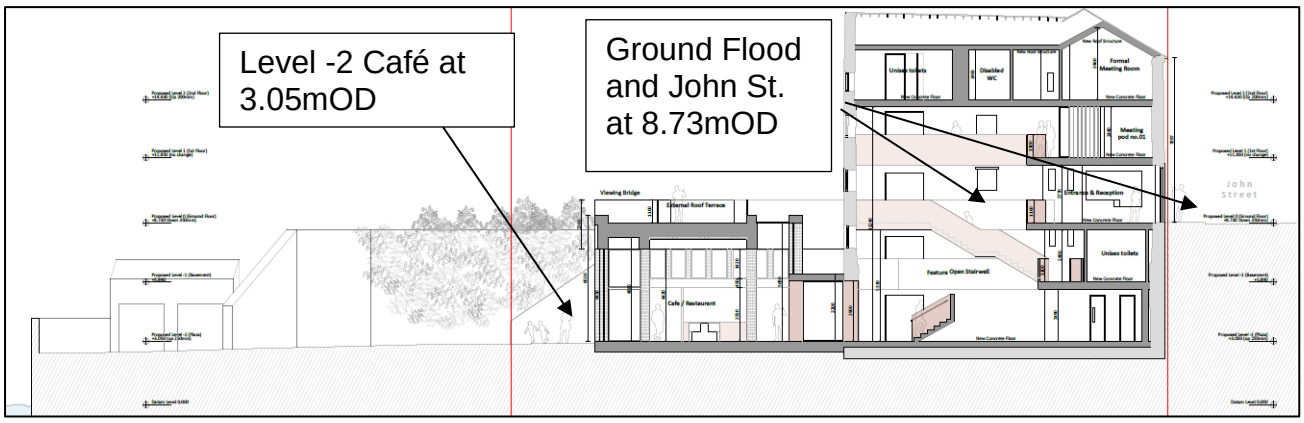


Figure 4-2: Long Section through site

4.2 Mitigation

4.2.1 Proposed Works/Site Level Strategy

An assessment of the coastal flood risk to the site is outlined Table 4-1 below**Error! Reference source not found.**. The coastal flood levels are from the ICWWS. The assessment demonstrates that there is 140mm freeboard between the lowest proposed FFL and the 0.5% AEP flood level. In the courtyard surrounding the Level -2 Plaza, levels range from 2.86mOD to 3.05mOD. In these areas, the freeboard ranges from 140mm to inundated by 5mm. This is a water compatible area, but mitigation measures still need to be considered as described in the sections below.

Table 4-1: Proposed Site Levels and Flood Levels

Proposed area	Vulnerability	Proposed Level (mOD)	Flood Level	Freeboard
Courtyard	Water Compatible	2.86-3.05	2.91	-0.05 - 0.14
Level -2 Plaza: Cafe	Low Vulnerability	3.05	2.91	0.14
Level 2 (John St)	Low Vulnerability	8.73	2.91	6.15

As discussed in Section 3.2.4, the 0.1% AEP flood level is 3.12mOD and the 0.5% AEP MRFS flood level is 3.41mOD. The Plaza/Café is therefore at risk of flooding in both of these events with flood depths of approx. 70mm in the 0.1% AEP event and 360mm in the MRFS event.

The minimum recommended FFL as per the WCDP SFRA is the 1% AEP fluvial or 0.5% tidal flood level, with climate change plus a freeboard of at least 300mm. However, it is also noted that for less vulnerable development in Flood Zone A and B, it may be that a finished floor level as low as the 1% or 0.5% AEP level could be adopted, provided the risks of climate change are included in the development through adaptable designs or resilience measures.

Given the nature of the existing building, it is not feasible to raise the lowest floor levels to the recommended 0.5% AEP climate change flood level plus 300mm freeboard (3.71mOD). Instead, only 140mm of freeboard can be provided above the 0.5% AEP flood level. Therefore, the approach taken to reduce the flood risk is in line with the recommendations of the WCDP SFRA to include resilient measures to account for the risk of climate change.

This approach should also reflect emergency planning and business continuity to be provided within the development. It may reflect the design life of the development, the proposed use, the vulnerability of items to be kept in the premises, the occupants and users, emergency plan and inclusion of flood resilience and recovery measures.

4.2.2 Access and Egress

The access road along the front of the site on John Street is in Flood Zone C, therefore access can be maintained to this location during flood events. However, the Café/Plaza at Level -2 is at risk of flooding in the 0.1% AEP event and in the climate change scenarios. A Flood Emergency Plan for the levels of the site potentially affected by flooding is recommended to ensure the safety of staff. The plan should outline contingency measures such as evacuation of the Café/Plaza during a significant flood event so as to manage the safety of staff and customers. The plan should be disseminated to the emergency services and the Local Authority, to ensure responding agencies are aware of the pre-planned emergency measures which are in place at the site. There is a wall to the rear of the courtyard/plaza which is not a formal flood defence, flood levels can potentially build up behind it and present a risk of failure which could result in a rapid inflow of water and debris. Water could also rise up through the ground or from stormwater accumulation.

4.2.3 Surface Water Design

The stormwater design should be undertaken in accordance with the GDSDS and the specific requirements of the Wexford County Development Plan (CDP) 2022-2028. Under Objective FRM07 new development must not increase flood risk elsewhere, including that which may arise from surface water run-off. The use of Sustainable Urban Drainage Systems (SuDS) is also required to minimise the extent of hard surfacing and paving (Objectives FRM14 & SWM01-08). Details of the surface water drainage design are included in a separate report, as completed by Brunner Engineering.

The landscape design for the site will have a ratio of 50% permeable surfaces, which would include landscaped areas, and 50% impermeable surfaces. The design will have slot drains at regular intervals to catch surface water as it falls toward the river.

It is recommended that consideration is given to the potential for limited outflow or backflow from the Barrow in times of high flood levels that could be above plaza level, as shown in Figure 3-5. This could lead to backflow or if non-return valves are used then restricted discharge of stormwater if there is not a pumped solution. The same would potentially apply to the foul system and toilets on the -2 level.

4.2.4 Flood Resilient Construction

Design for flood resilient construction accepts that floodwater will enter buildings and provides for this in the design and specification of internal buildings and finishes. These measures limit damage caused by floodwater and allow relatively quick recovery.

Flood resilient constriction should be implemented in Level -2 and can be achieved by using wall and floor materials such as ceramic tiling that can be cleaned and dried relatively easily, provided that the substrate materials are also resilient. Electronics, appliances, and water sensitive fittings will be raised above the 0.5% AEP tidal flood level by 300mm to 3.71mOD. Any fuel/oil or hazardous material storage should also be kept at or above this level. Non return valves on the surface water/foul system may also be appropriate.

4.2.5 Compensatory Storage

As per the SFRA completed for the site as part of the Wexford CDP, compensatory storage is to be provided to balance floodplain loss as a result of raising ground levels within Flood Zone A or B. The storage should be provided within the flood cell and on a level for level basis up to the 1% level.

Since the principal source of flooding is tidal there is an infinite volume of inflow and loss of flood storage is not an issue and it can be assumed that no increase in local flood levels are generated and conveyance is not impacted.

5 The Justification Test for Development Management

5.1 Strategy

As the development is partially located in Flood Zone A, the Justification Test has been undertaken to confirm the site is appropriate for development. The development is a low vulnerability development type and so the JT is required, as indicated in Table 3.1 of The Planning System and Flood Risk Management.

The planning guidance appropriate to this development is, "The Planning System and Flood Risk Management" and sets out a framework within which the planning authority should consider proposals for new development in areas of flood risk. This framework is called the Justification Test for Development Management.

Under the County Development Plan, the site is zoned Town Centre (TC). TC zonings can include for high or less vulnerable development. This results in a varying requirement for the application of the Justification Test and potential suitability of the development. Where such conditions exist the zoning objectives include a clarification of the suitability of the land use vulnerability within individual land zonings.

In the following text, each of the criteria within the JT is responded to as they relate to the proposed development. For ease of reading, where the responses are supported by technical detail, which is contained in this report, an appropriate chapter has been referenced.

5.2 Justification Test: Part 1

The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of the planning guidelines.

In line with "The Planning System and Flood Risk Management Guidelines for Planning Authorities (2009)" a Strategic Flood Risk Assessment (SFRA) has been conducted as part of the preparation of the LAP. Under the LAP and the SFRA, the site is zoned Town Centre (TC). As stated above it is considered that the proposed development complies with the land use zoning at the site.

Conclusion: It has been outlined that the proposed development complies with the TC land use zoning onsite and that the LAP was adopted taking into account The Planning System and Flood Risk Management Guidelines.

5.3 Justification Test: Part 2

The proposal has been subject to an appropriate flood risk assessment that demonstrates:

(i) the development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk

As part of the FRA, the site is identified as being located within Flood Zone A, B and C. Since the principal source of flooding is tidal there is an infinite volume of inflow and loss of flood storage is not an issue. This means that be no increase in local flood levels are generated and conveyance is not impacted. The site layout includes multiple slot drains and the landscape design for the site will have a ratio of 50% permeable surfaces, which would include landscaped areas, and 50% impermeable surfaces to further reduce flood risk.

(ii) the development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;

The lowest level of the development is Level -2 where it is proposed to have a café. This level is identified as being at risk in the 0.1% AEP event. As this development is lower vulnerability development, mitigation measures are proposed to minimise the flood risk. Access routes are placed above the 0.1% AEP event and will not be impacted by the predicted flood events. A Flood Evacuation Plan is also recommended to ensure the safety of personnel and visitors on site. The plan should outline contingency measures that have been considered to maximise the safety of staff and customers of the proposed site during a potential flood event where flood levels place a loading pressure on the river side of the boundary wall (not a formal flood defence). Flood resilient construction measures to Level -2 are recommended to limit damage caused by floodwater and allow relatively quick recovery.

(iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access.

The access and egress to the site via John Street is in Flood Zone C and at low risk of flooding from future climate change. As the lowest level of the development (Level -2) is identified as being at risk in climate change scenarios, the Flood Emergency Plan which is recommended will ensure the safety of personnel and visitors on site from future flood events through the restriction of use/access to Level -2 during a flood event. Flood resilient construction measures are recommended to limit damage caused by floodwater and allow relatively quick recovery, including raising electronics above the 0.5% climate change level with 300mm freeboard to 3.71mOD. The impact of high food levels will also be considered in relation to surface water discharge and the foul system.

(iv) The development proposed will address the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

To address Part iv of the JT, please refer to supplementary Planning Report and Statement of Consistency provided as part of the application.

6 Conclusions

JBA Consulting has undertaken a detailed Flood Risk Assessment for the proposed site development in New Ross, Co. Wexford. The site is the location of a previous grain store, and it is proposed to build a new premises on the land.

The site was identified as being partially within Flood Zone A, B and C under the NCFHM flood mapping, which supersedes the CFRAM study in terms of maximum tidal flood levels. Significant site-specific detailed analysis has been undertaken to clarify the source and potential depth and extent of flooding at the proposed site. The analysis revealed that the dominant source of flood risk to the site is from the River Barrow located adjacent to the site.

The lowest level of the development is the Level -2 Plaza where it is proposed to have a Café. The proposed finished floor level at Level -2 is 3.05mOD. This gives a freeboard of 140mm above the 0.5% AEP tidal event, as per the ICWWS flood levels. While this does not meet the WCDP SFRA criteria of 300mm freeboard above the 1% AEP plus climate change event, FFLs as low as the 1% AEP event can be constructed in certain cases provided the risks of climate change are manged through resilience measures.

This Level -2 Plaza is identified as being at risk in the 0.1% AEP event and climate change events. As this development is lower vulnerability development, mitigation measures are proposed to minimise the flood risk. Access routes are placed above the 0.1% AEP event and will not be impacted by the predicted flood events. A Flood Emergency Plan is also recommended to ensure the safety of personnel and visitors on site. The plan should outline contingency measures that have been considered to maximise the safety of staff and customers of the proposed site during a potential flood event. Flood resilient construction measures to Level -2 are recommended to limit damage caused by floodwater and allow relatively quick recovery.

Since the development is partly within Flood Zones A and B, the Justification Test has been undertaken and passed for the development.

The Flood Risk Assessment was undertaken in accordance with 'The Planning System and Flood Risk Management' guidelines and is in agreement with the core principles contained within.

A 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 (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.

Table A-1: 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 purposes of the Planning Guidelines, there are 3 types or levels of flood zones, A, B and C.

Table A-2: Flood Zones

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.

A.3 Consequence of Flooding

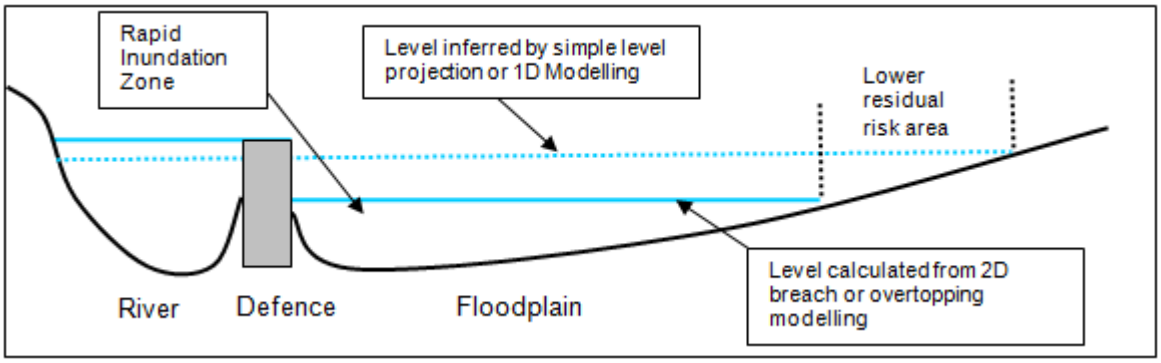
Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence and reliability of mitigation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

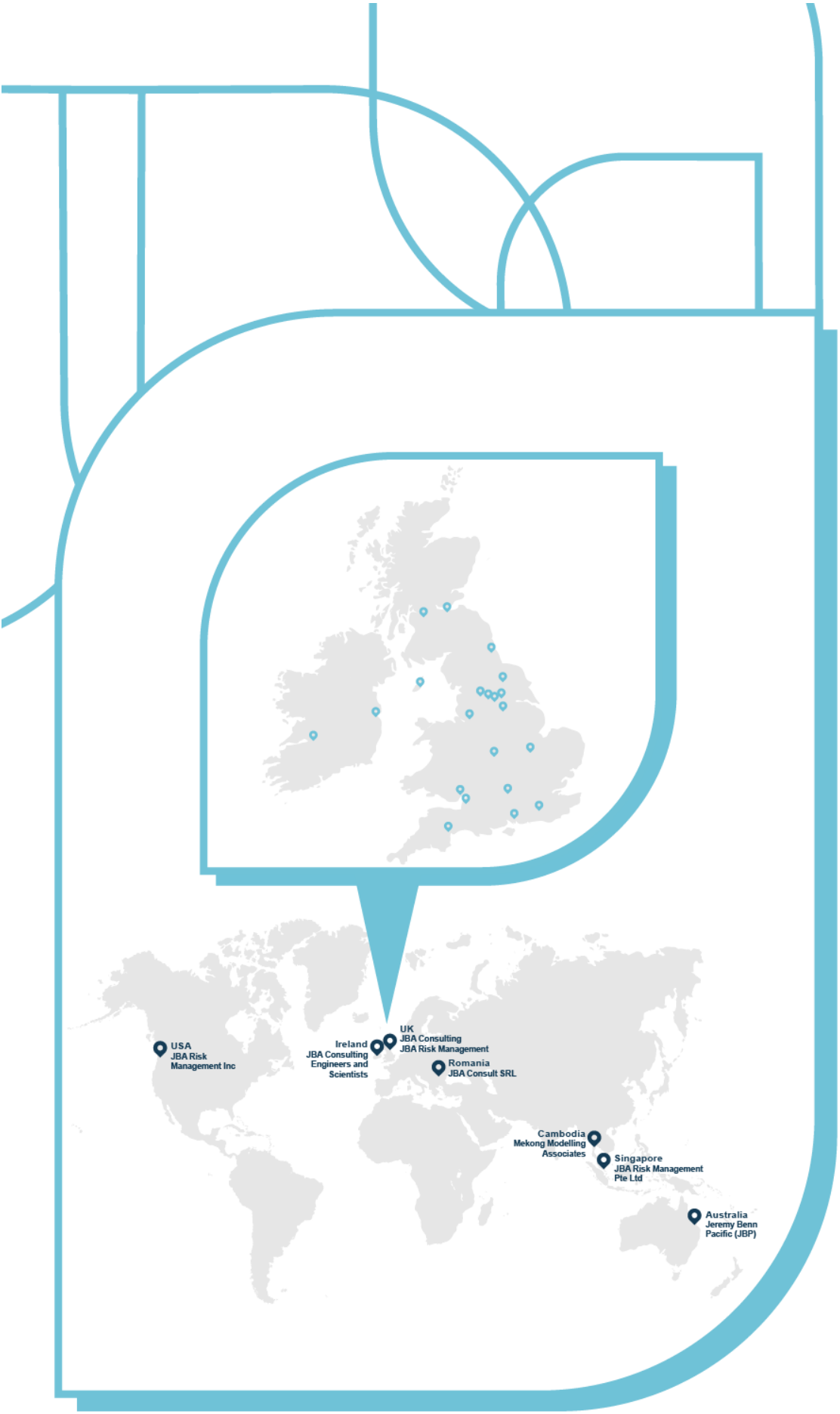
The 'Planning System and Flood Risk Management' provides three vulnerability categories, based on the type of development, which are detailed in Table 3.1 of the Guidelines, and are summarised as:

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.

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 is known as residual risk.


Rapid Inundation Zone
Level inferred by simple level projection or 1D Modelling
Lower residual risk area
Level calculated from 2D breach or overtopping modelling
River
Defence
Floodplain



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Thirsk
Wallingford
Warrington

Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
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