



McKenna Consulting Engineers
Civil & Structural

Church House,
23 Nuns Island,
Co. Galway

Flood Risk Assessment

December 2022



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DOCUMENT APPROVAL

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Date December 2022	Signature 	Signature 

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1. INTRODUCTION

1.1 General

This Flood Risk Assessment Report has been prepared by Jennings O'Donovan & Partners Limited for McKenna Consulting Engineers to assess the flood risk associated with the site located at Church House, 23 Nuns Island, Co Galway. It is proposed to renovate and extend the existing "Manse" to the rear of the existing Nuns Island theatre to house a new Creative Centre.

The site is located in Galway city, as outlined in red in Figure 1 below.

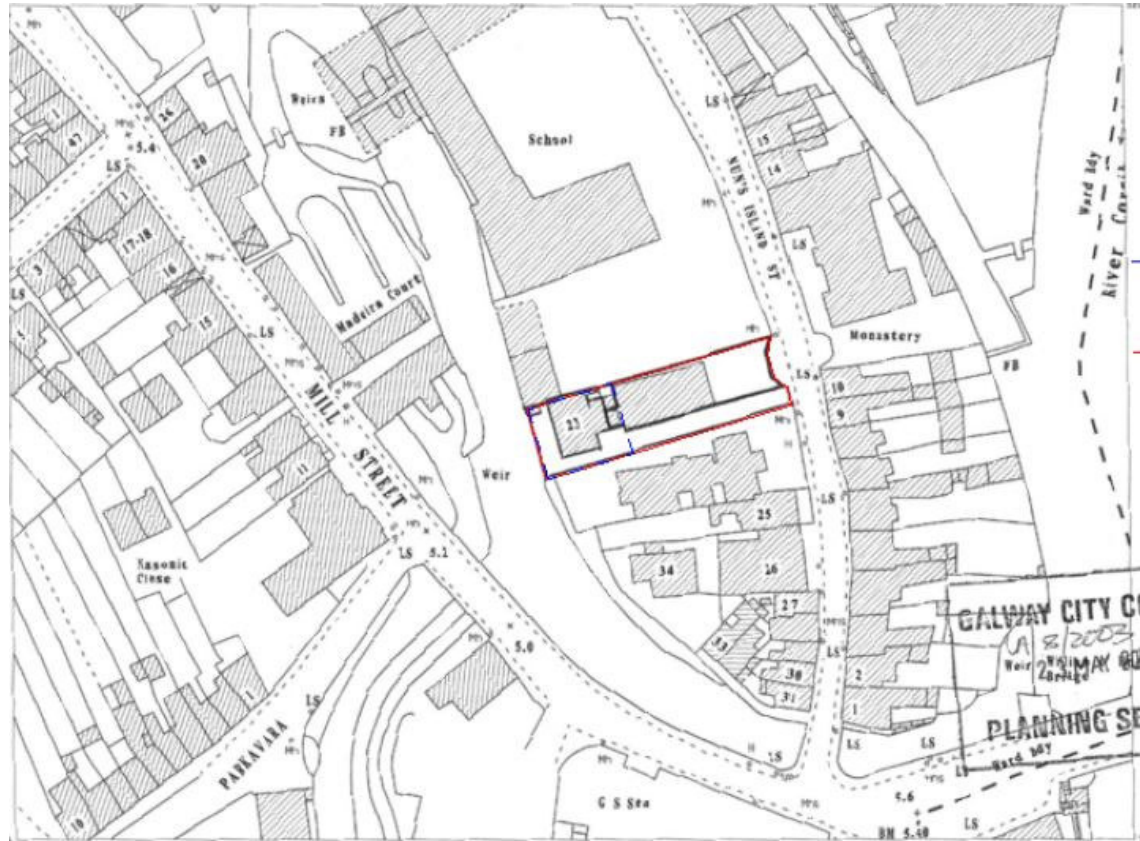


Figure 1.1: Aerial Site Location

Details of the site are outlined in Table 1 below.

Table 1 Proposed Development Works

Component	Proposed Works
Site Area	<ul style="list-style-type: none"> Approx. 0.07 ha

This Flood Risk Assessment covers the site in Nuns Island, Co. Galway. It was prepared in accordance with the report 'The Planning System and Flood Risk Management - Guidelines for Planning Authorities' issued by the Department of Environment, Heritage and Local

Government in November 2009. Flood risk from fluvial, surface water and ground water sources has been assessed based on existing available information.

The assessment methodology involved researching and collating flood related information from the following data sources:

- Base maps – Ordnance Survey of Ireland;
- Flood Hazard Maps and flooding information for Ireland, (www.floodmaps.ie);
- Office of Public Works (OPW);
- Geological Survey of Ireland (GSI) maps on superficial deposits;
- EPA hydrology maps;
- CFRAMS (Catchment Flood Risk Assessment & Management Study);
- Galway County Development Plan 2022 – 2028

1.2 Scope

This Flood Risk Assessment is based on the following:

- Department of Environment, Heritage and Local Government guidelines for Planning Authorities covering Flood Risk *Management (The Planning System and Flood Risk Management: Guidelines for Planning Authorities 2009)*
- Risk of flooding to the Proposed Development Site from flood flow from neighbouring watercourses.
- Risk of flooding resulting from direct rainfall.
- Risk of flooding from groundwater.

In addition to the above, the study also examined any possible impact the proposed works may have on the existing drainage regime locally adjacent to the Proposed Development Site. The impacts addressed under this heading comprise:

- The impact of surface water runoff on the flow regimes in neighbouring watercourses.
- Loss of floodplain.
- Review of historical flood records.

2. PLANNING GUIDELINES

In November 2009, the Department of Environment, Heritage and Local Government issued a guidance document to planning authorities in relation to flood risk management, titled '*The Planning System and Flood Risk Management*'. These guidelines set out the policy on development and flood risk in Ireland and provide a framework for the integration of flood risk assessment into the planning process. The objective is to ensure that flood risk is considered at all stages in the planning process and, as a result, to:

- Avoid inappropriate development in areas at risk of flooding,
- Avoid new developments increasing flood risk elsewhere,
- Ensure effective management of residual risks for development permitted in flood plains.

The guidelines set out a staged approach for the consideration of flood risk in relation to developments as follows:

Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and Local Area Plans (LAP's) or a proposed development site that may warrant further investigation at the appropriate lower level plan or planning application levels;

Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps. Where hydraulic models exist, the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped; and

Stage 3: Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

The guidelines classify developments into three vulnerability classes based on the effects of flooding:

- Highly vulnerable development,
- Less vulnerable development,
- Water compatible development.

“Creative Centres” are classified as leisure / commercial buildings which are deemed as less vulnerable developments.

The guidelines also classify land areas into three flood zones based on the probability of flooding. Flood zones are defined as follows in the guidelines:

- Zone A is at highest risk. In any one year, Zone A has a 1 in 100 year (1%) chance of flooding from rivers and a 1 in 200 year (0.5%) chance of flooding from the sea.
- Zone B is at moderate risk. The outer limit of Zone B is defined by the 1 in 1,000 year (or 0.1%) flood from rivers and the sea.
- Zone C is at low risk. In any one year, Zone C has less than 1 in 1,000 year (<0.1%) chance of flooding from rivers, estuaries or the sea.

It is stated in the guidelines that during the identification of flood zones, no account should be taken of any flood relief walls or embankments.

Table 2.1: Matrix of Vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test (reproduced from Table 3.2 of Planning Guidelines)

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 2.1, which is reproduced from the guideline document to Planning Authorities in relation to Flood Risk Management states that dwelling houses should be located within Flood Zone C. Section 4 of this Flood Risk Assessment document will consider the Flood Zone assignment for the proposed site.

Table 2.1 refers to the use of a Justification Test under certain circumstances. In cases where there are insufficient sites available to locate a development in the appropriate low flood risk zone, the guideline documents allow for consideration of sites within flood risk zones. A Justification Test is then required to assess such proposals in light of proper planning and sustainable development objectives.

This report considers the Flood Risk of the proposed development site in relation to Stages 1 and 2 of the staged approach outlined above.

3. PROPOSED DEVELOPMENT SITE

3.1 Site Description

The proposed development site is located within Nuns Island, Co Galway, along the Mill Street Road, in Galway City.

A topographical map of the proposed site and surrounding areas levels are shown in Figure 3.1 below.

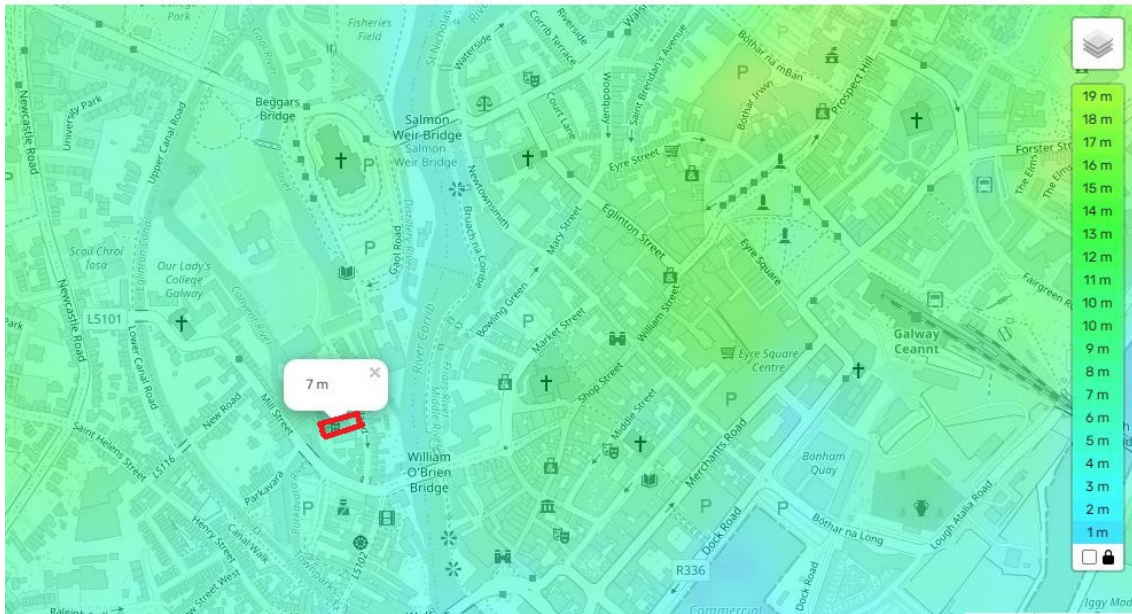


Figure 3.1: Topographical map of the proposed development site.

The proposed development site is relatively flat with ground levels approximately 7m AOD.

4. FLOOD RISK REVIEW

4.1 Approach

The risk of flooding to the proposed development site shall be assessed in relation to the following criteria:

- Fluvial Risk: Inundation from flow from neighbouring watercourses
- Pluvial Risk: Flooding due to direct rainfall.
- Groundwater Risk: Flooding due to a high-water table.
- History of Flooding
- Available Predictive Flood Risk Mapping
- Impact of presence of the proposed development on the existing flood risk regime at the proposed development site.

4.2 OPW Catchment Flood Risk Assessment and Management (CFRAM)

The proposed site is approximately 275m North from the mouth of the River Corrib. The River Corrib is the main river running through Galway City, and as such, has been identified as a High Priority Watercourse (HPW) during the preparation of the PFRA to be modelled under the Western CFRAM Study.

As a result, the accuracy of the modelling increased significantly. In channel and structures cross sections were surveyed and incorporated into a hydraulic river model. The hydrological inputs were produced using a full Flood Studies Update (FSU) methodology. The CFRAM mapping also takes account possible flood risk scenarios associated with climate change. As such the CFRAM mapping produced from this model is the most appropriate source of flood risk information currently available for the proposed development site. The Galway CFRAM mapping is included in Appendix B.

4.2.1 Fluvial and Tidal Flood Risk.

The CFRAM mapping, as shown in Figure 4.1 below, predicts that fluvial flooding will not occur within the development site for all modelled flood AEP probabilities. Therefore, the proposed development is considered to not be at risk of fluvial flooding. It should be noted that although the CFRAM map colour coding indicates that fluvial flooding from the 1 in 1000-year may occur on site, model nodes around the development site indicate the river levels are between 5.57m AOD and 4.99m AOD for the 1 in 1000-year flood event – well below the development ground level of approx. 7m AOD. Potential fluvial flooding may be a result of inadequate storm drainage currently on site. This can be alleviated with the use of SUDS techniques and a suitably designed drainage system.

The CFRAM mapping, as shown in Figure 4.2 below, predicts that tidal flooding will not occur within the development site for all modelled flood AEP probabilities.

As the predicted fluvial flooding for the 1 in 1000-year flood event reaches part of the development site, the site is classified as flood zone B. The proposed development is considered to be at moderate risk of flooding.

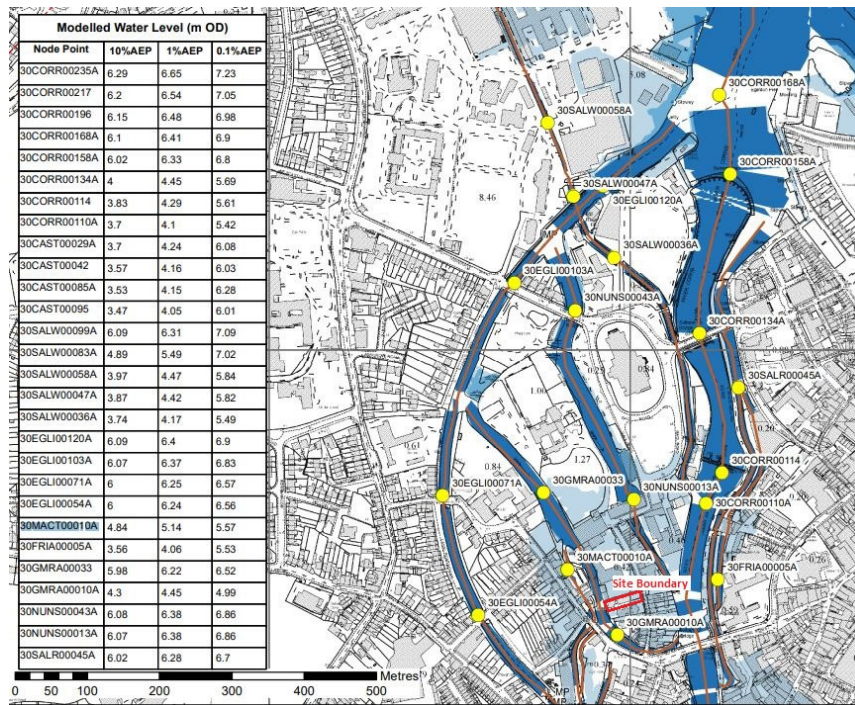


Figure 4.1: Fluvial CFRAM Mapping (Source: Floodinfo.ie)

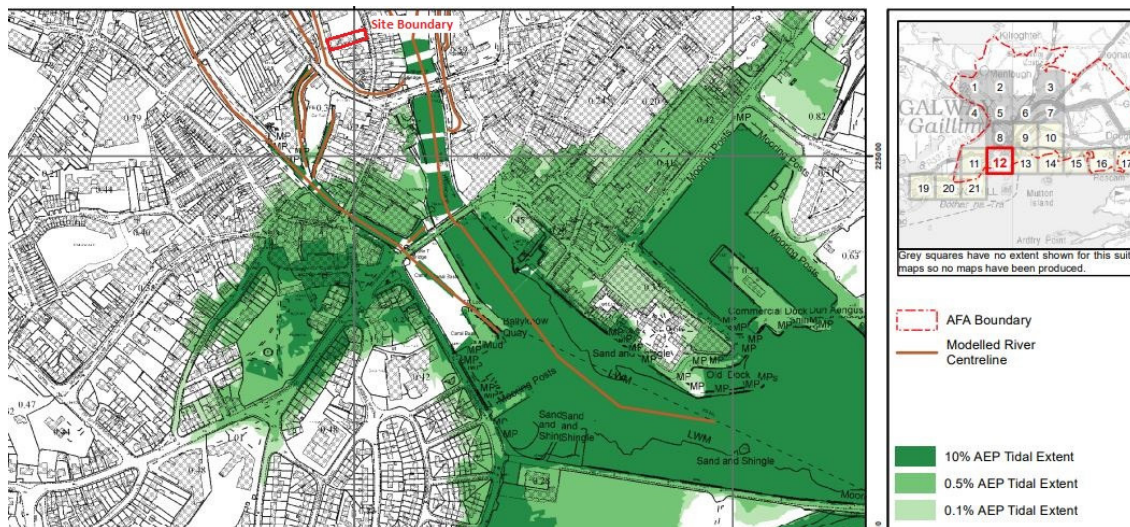


Figure 4.2: Tidal CFRAM Mapping (Source: Floodinfo.ie)

4.2.2 Historical Flood Risk.

The OPW's online Floodmaps portal provides information on reported floods, in the form of reports, photos, and newspaper articles.

The database indicates numerous flood events approximately 300 metres South of the development site – the flood events are a result of heavy rainfall, very high tides or a combination of both occurring simultaneously. The flood events occurred between 1995 and 2019. It should be noted that the proposed development site is approximately 2 metres higher in elevation than the area where the past flood events occurred.

No previously recorded flood event for the proposed development site is noted.

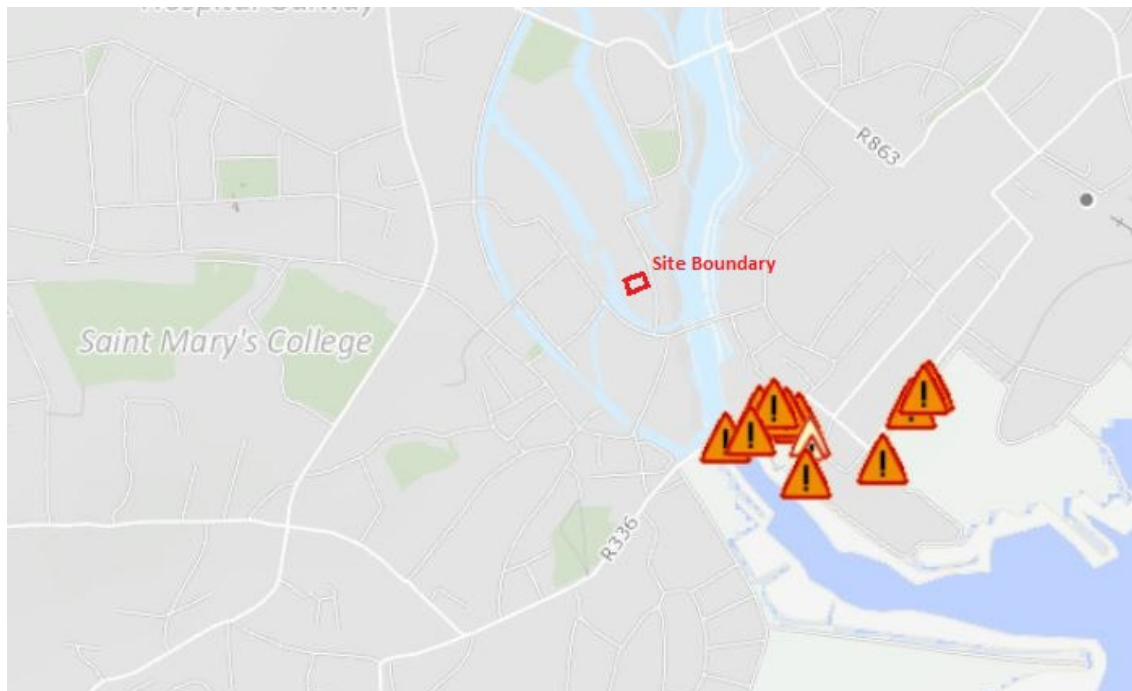


Figure 4.3: Historical Flood Events (Source: Floodinfo.ie)

4.3 Pluvial Flood Risk

As mentioned in Section 3 above, the development site is relatively flat. The proposed development and associated works will not increase the impermeable area of the existing site and therefore, surface water runoff from the site will not be increased. As a result, pluvial flooding on site and downstream will not be affected by the proposed development, however the design of appropriate drainage is recommended to prevent localised flooding on site and help mitigate any flood risks in the surrounding areas.

The average annual rainfall for this region is 1192.9mm, (<https://www.met.ie/climate/available-data/monthly-data>, Athenry, up to 26-Oct-2022). The mean Potential Evapotranspiration (PE) for Casement for the past four years is 489.4mm (www.met.ie/climate/available-data/monthly-data). Actual evapotranspiration is estimated at $0.95 \times PE = 464.9\text{mm}$. The effective rainfall represents the water available for run-off and groundwater recharge and equals the annual rainfall less the actual evaporation or $1192.9 - 464.9 = 728\text{mm}$.

The use of gravel surfacing and grassed areas in the amenity spaces, where appropriate, will allow rainwater to percolate to ground. The site surface water drainage system from roof and hard surfaces will be designed to best practice to provide protection from pluvial flooding. The use of SUDs techniques such as rainwater harvesting tanks are considered to offer potential solutions. The drainage design should be such as to cater for short, intense rainstorms.

4.4 Groundwater Flood Risk

The Geological Survey of Ireland mapping website indicates that the Proposed Development Site is underlain by undifferentiated quartz-diorite gneiss, quartz diorite gneiss and granitic gneiss and metagabbro and related lithologies. The bedrock indicated is a poor aquifer, (Pi), with no springs / wells drawing from the area. The groundwater vulnerability was determined to be high. Appendix C includes the GSI mapping for the above.

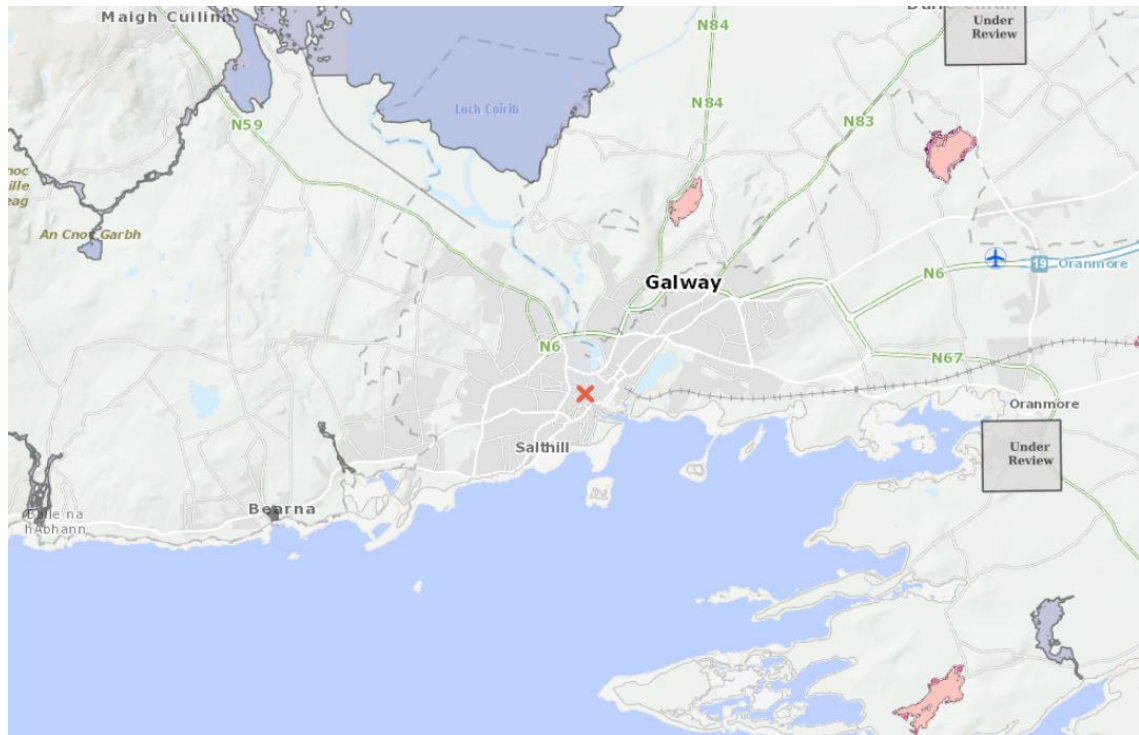


Figure 4.4: Galway Ground Water flooding maps (Site identified by red crosshair)

The OPW Floodmaps portal includes mapping of the GSI Groundwater Flooding for Galway. The mapping was examined to determine if there was an existing risk from groundwater flooding at the site. The mapping indicates that the site is located approximately 4km away for the lowest probability groundwater flooding event. Therefore, there is no foreseeable risk from groundwater flooding to the site.

Furthermore, groundwater flooding typically only occurs in karst limestone areas in the vicinity of turloughs. Given that the bedrock at the development site is not karst limestone, the risk of groundwater flooding is further negated.

4.5 Impact of Development on current Flood Regime

All surface water runoff from proposed impermeable surfaces within the proposed development site will be collected in a dedicated drainage network. Sustainable Drainage Systems (“SuDS”) will be implemented where possible to provide elements of source control of surface water, attenuation of runoff and water quality improvements. The site surface water drainage system will be designed to best practice to provide protection from surface runoff due to direct rainfall. The proposed development site is not located in a floodplain, ensuring that the Development will not result in any loss of floodplain.

4.6 Summary of Flood Risk

Table 4.2 below provides a summary of the flood risk at the Proposed Development Site.

Table 4.2: Flood Risk Summary Table

Source	Pathway	Receptor	Comment
Tidal	Overbank	Proposed Development	There is no apparent risk of Tidal flooding at the proposed development site.
Fluvial	Overbank	Proposed Development	There is moderate identified risk of fluvial flooding at the proposed development site. CFRAM mapping indicates part of the development site is vulnerable to a 1 in 1000-year flood event
Pluvial	Ponding of Rainwater on site	Proposed Development	There is no identified risk of pluvial flooding at the proposed development site. It is recommended that the proposed storm drainage is designed with SuD's principles, where possible, to ensure best practices are upheld and the increase in flows from the development site are catered for.
Groundwater	Rising Groundwater Levels	Proposed Development	Based on the GSI mapping and OPW mapping, there is no apparent risk from groundwater flooding at the proposed development site.

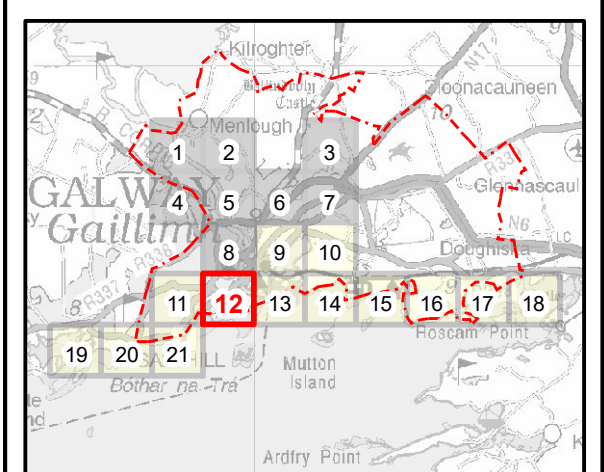
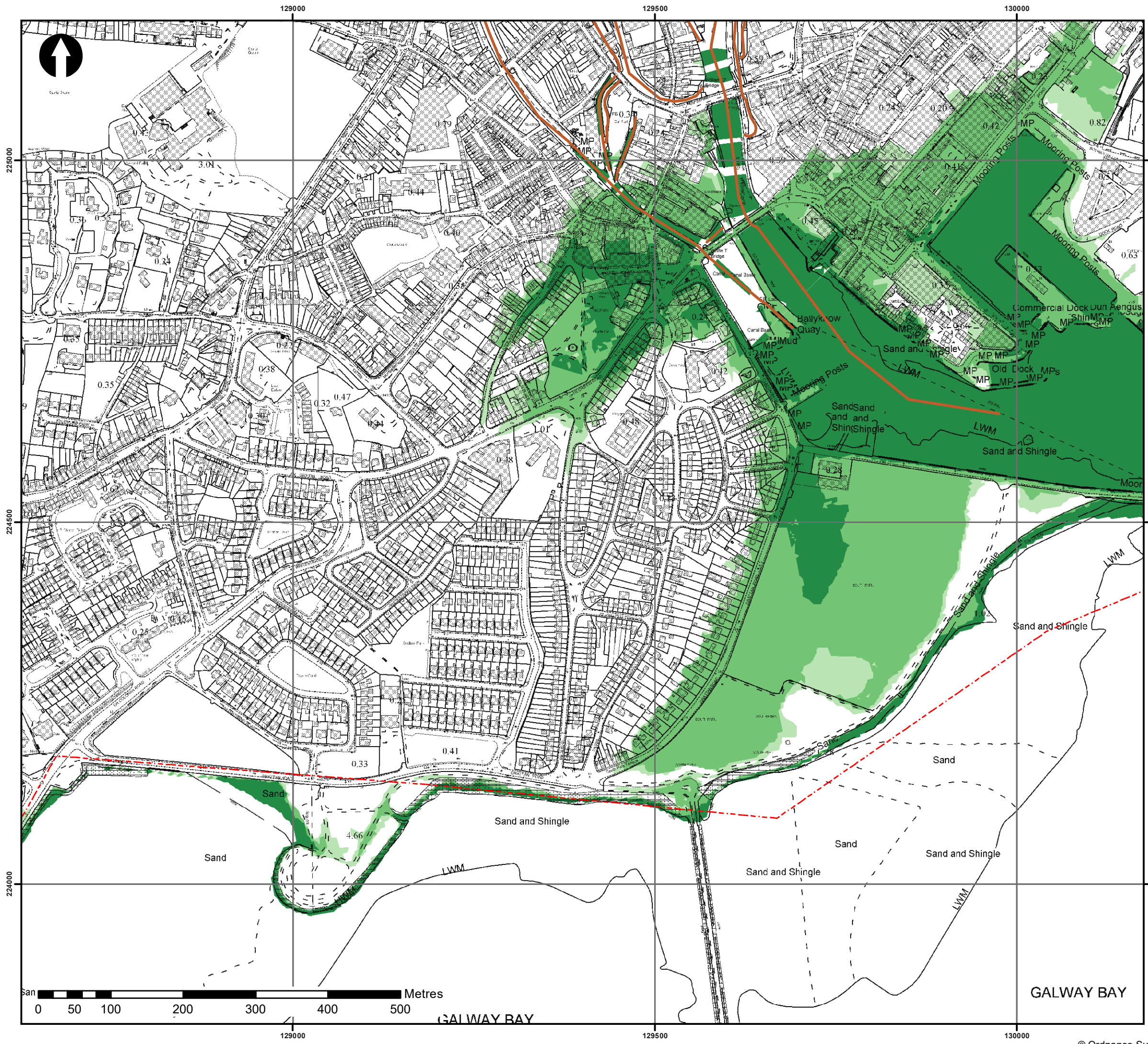
5. CONCLUSION

There is no apparent risk of tidal flooding at the proposed development site, however, part of the development site has been identified as being vulnerable to a 1 in 1000-year fluvial storm event. It is reasonable to conclude that the site lies within Flood Zone B as defined by the guidance document '*The Planning System and Flood Risk Management*'. There is no apparent risk of pluvial flooding in the development site. However, the provision of a stormwater run-off collection system incorporating SUDs features is recommended. There is no apparent risk of groundwater flooding at the proposed development site.

This research has concluded that there is no record of flooding previously occurring on the proposed development site. The proposed development site is not located in a floodplain; therefore, the proposed works will not result in a loss of floodplain. The proposed works are unlikely to increase the current flood risk in this catchment.

The conclusion of this FRA is that the proposed development site is at moderate risk of flooding as defined by the guidance document '*The Planning System and Flood Risk Management*', and the proposed works will not result in any significant change in risk or flooding regime. Additionally, the Development is deemed to be appropriate (as set out in Table 3.2 of the guidelines for Flood Risk Management (DoEHLG/OPW, 2009) as "Creative Centres" are classified as leisure / commercial buildings which are deemed as less vulnerable and therefore can be developed in Flood Zone B locations. As such, no further stages of flood risk assessment are therefore required.

APPENDIX A
CFRAM Mapping



Grey squares have no extent shown for this suite of flood maps so no maps have been produced.

- AFA Boundary
- Modelled River Centreline
- 10% AEP Tidal Extent
- 0.5% AEP Tidal Extent
- 0.1% AEP Tidal Extent

IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.




OPW
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The Office of Public Works

The Office of Public Works
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Trim
Co. Meath



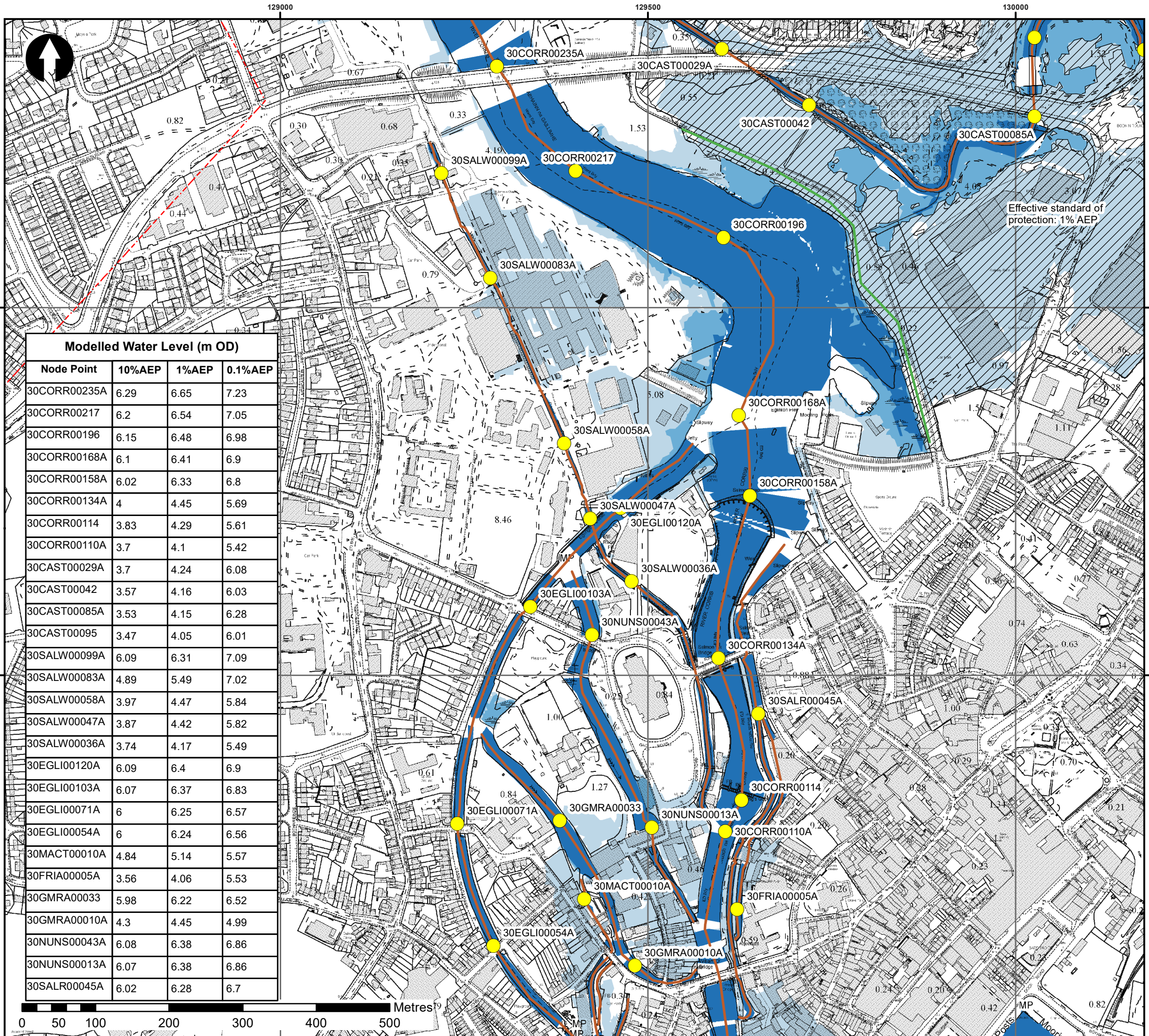
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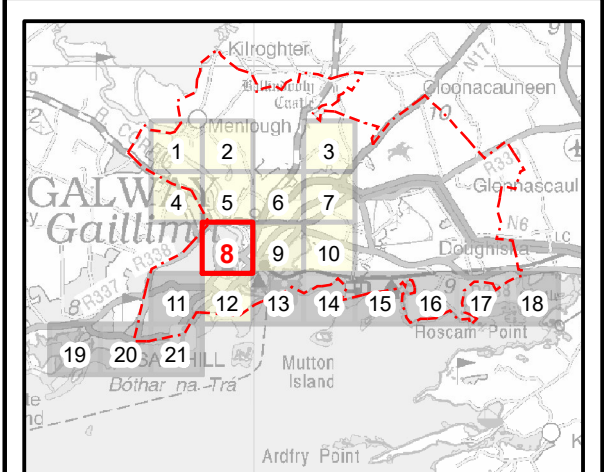


WESTERN
CFRAM
STUDY
CATCHMENT FLOOD RISK
ASSESSMENT AND MANAGEMENT

Map: Galway City Flood Extent		Final
Map Type: Flood Extent		
Map Area: HPW	Source: Coastal	Scenario: Current
Drawn by: KF	Date: Apr 2017	1:5,000
Checked by: TS	Date: Apr 2017	
Approved by: JC	Date: Apr 2017	Original @ A3
Map No: W30GLW_EXCCD_F1	Sheet: 12 of 21	



Modelled Water Level (m OD)			
Node Point	10%AEP	1%AEP	0.1%AEP
30CORR00235A	6.29	6.65	7.23
30CORR00217	6.2	6.54	7.05
30CORR00196	6.15	6.48	6.98
30CORR00168A	6.1	6.41	6.9
30CORR00158A	6.02	6.33	6.8
30CORR00134A	4	4.45	5.69
30CORR00114	3.83	4.29	5.61
30CORR00110A	3.7	4.1	5.42
30CAST00029A	3.7	4.24	6.08
30CAST00042	3.57	4.16	6.03
30CAST00085A	3.53	4.15	6.28
30CAST00095	3.47	4.05	6.01
30SALW00099A	6.09	6.31	7.09
30SALW00083A	4.89	5.49	7.02
30SALW00058A	3.97	4.47	5.84
30SALW00047A	3.87	4.42	5.82
30SALW00036A	3.74	4.17	5.49
30EGLI00120A	6.09	6.4	6.9
30EGLI00103A	6.07	6.37	6.83
30EGLI00071A	6	6.25	6.57
30EGLI00054A	6	6.24	6.56
30MACT00010A	4.84	5.14	5.57
30FRIA00005A	3.56	4.06	5.53
30GMRA00033	5.98	6.22	6.52
30GMRA00010A	4.3	4.45	4.99
30NUNS00043A	6.08	6.38	6.86
30NUNS00013A	6.07	6.38	6.86
30SALR00045A	6.02	6.28	6.7



Grey squares have no extent shown for this suite of flood maps so no maps have been produced.

- AFA Boundary
- Defended Area
- Defence – Embankment
- Model Nodes
- Modelled River Centreline
- 10% AEP Fluvial Extent
- 1% AEP Fluvial Extent
- 0.1% AEP Fluvial Extent

IMPORTANT USER NOTE:
THE FLOWS PRESENTED IN THIS MAP ARE RELEVANT TO THE LOCATION SHOWN ONLY. THEY SHOULD NOT BE USED WITHOUT FIRST REFERRING TO THE HYDRAULIC MODELLING REPORT TO UNDERSTAND THE CONTEXT OF THE HYDROLOGY AT THE SITE.

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WESTERN
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CATCHMENT FLOOD RISK
ASSESSMENT AND MANAGEMENT

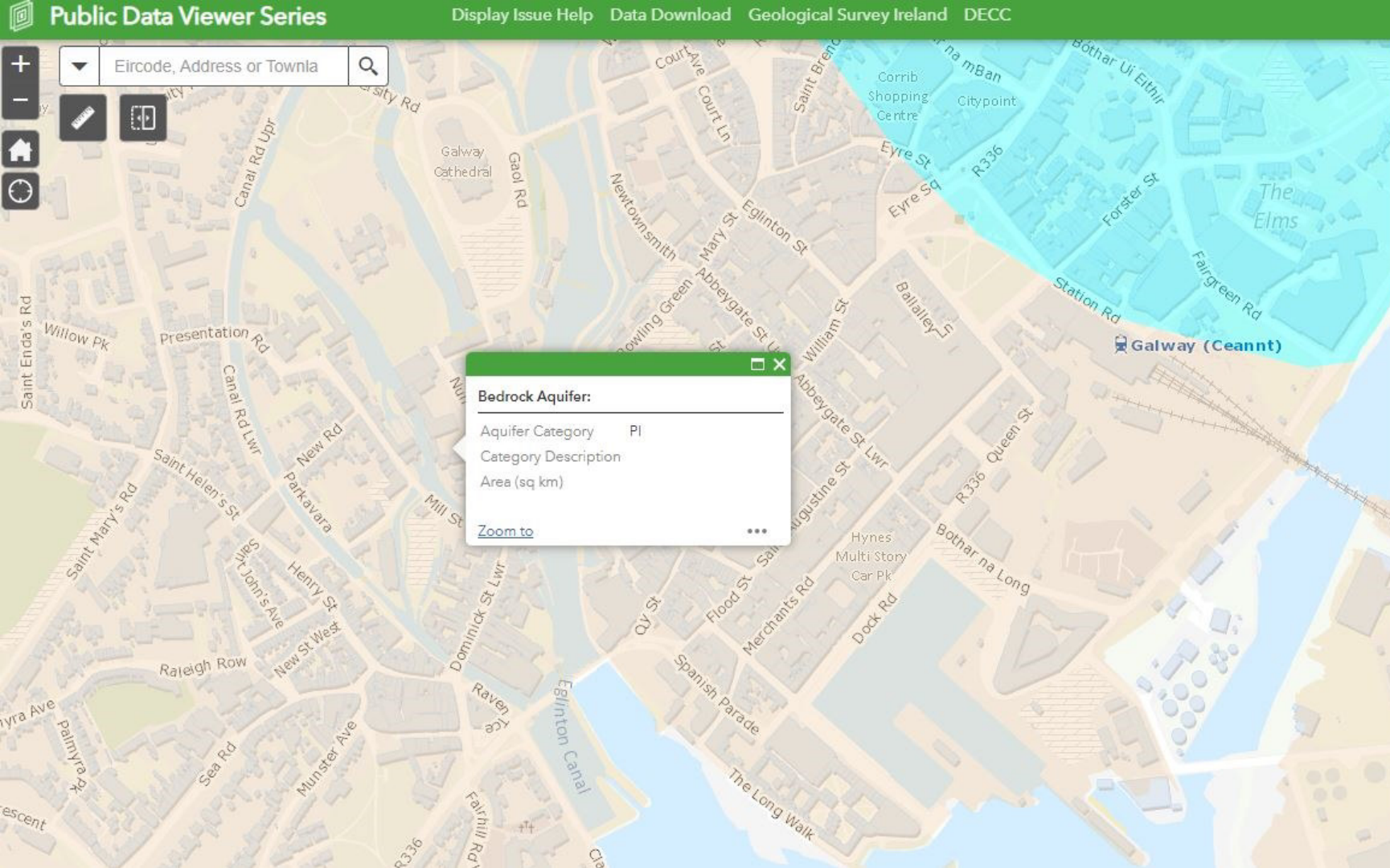
Map: Galway City Flood Extent		Final
Map Type: Flood Extent		
Map Area: HPW	Source: Fluvial	Scenario: Current
Drawn by: KF	Date: Dec 2017	Scale: 1:5,000
Checked by: TS	Date: Dec 2017	Original @ A3
Approved by: JC	Date: Dec 2017	
Map No: W30GLW_EXFCD_F4_08	Sheet: 8 of 21	

APPENDIX B
GSI Mapping

▼ Eircode, Address or Townla 🔍



Description	Undifferentiated
Label	Om
Formation	Metagabbro and Orthogneiss Suite (Undifferentiated)
Definition	Pracht et al (2004)
Type Section	
Lithological Description	Undifferentiated Quartz-Diorite Gneiss (Qd), Quartz Diorite Gneiss & Granitic Gneiss (Qg) and Metagabbro and Related Lithologies (Mg)
Lithological Summary	
Lithological Legend	Metagabbro and Orthogneiss
Rock Type	Metagabbro and Orthogneiss
Zoom to	...

**Bedrock Aquifer:**

Aquifer Category PI
Category Description
Area (sq km)

[Zoom to](#)**Legend****Groundwater Resources (Aquifers)**

Gravel Aquifer

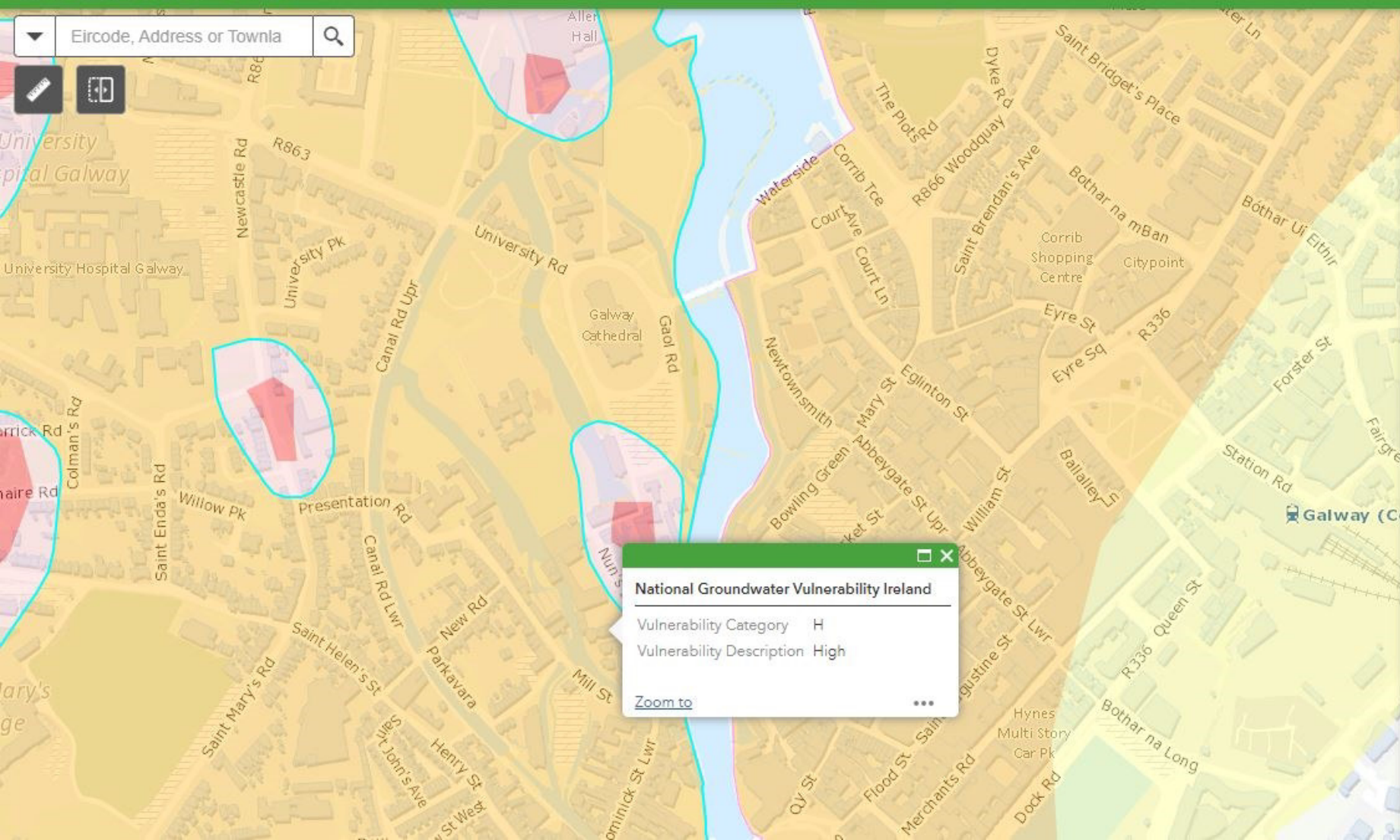
- Regionally important gravel aquifer
- Locally important gravel aquifer

Bedrock Aquifer

- Rkc - Regionally Important Aquifer - Karstified (conduit)
- Rkd - Regionally Important Aquifer - Karstified (diffuse)
- Rk - Regionally Important Aquifer - Karstified
- Rf - Regionally Important Aquifer - Fissured bedrock
- Rf/Rk - Regionally Important Aquifer - Fissured bedrock/Regionally Important Aquifer - Karstified
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Lk - Locally Important Aquifer - Karstified
- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- PI - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Pu - Poor Aquifer - Bedrock which is Generally Unproductive
- Lake
- Unclassified



▼ Eircode, Address or Townla 🔍



Legend

- Groundwater Vulnerability**
- Groundwater Vulnerability
 - Rock at or near Surface or Karst
 - Extreme
 - High
 - Moderate
 - Low
 - Water

National Groundwater Vulnerability Ireland

Vulnerability Category H

Vulnerability Description High

[Zoom to](#) ⋮