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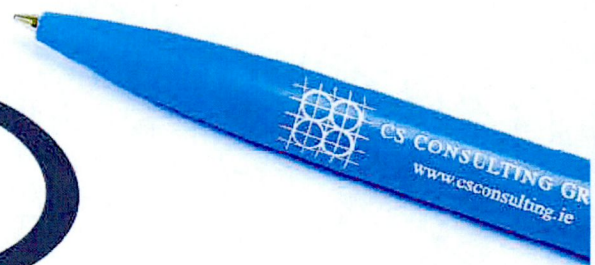
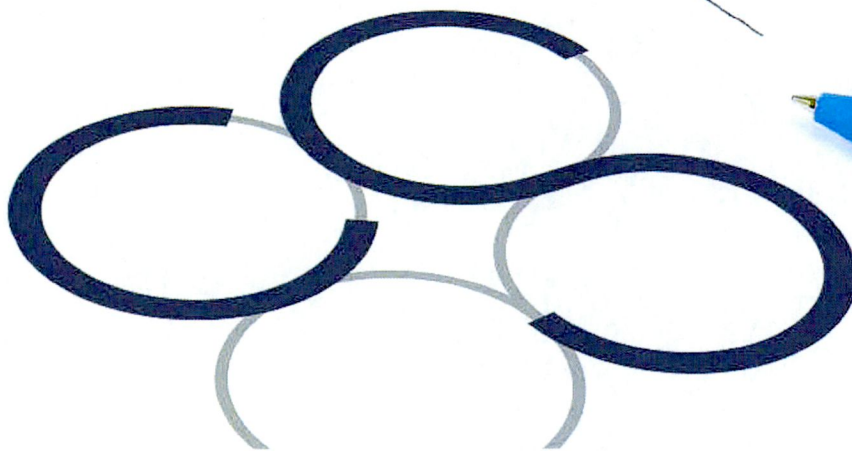
DUBLIN LONDON LIMERICK

Site Specific Flood Risk Assessment
Proposed CEMETERY Development at
City West
Saggart, County Dublin

Client: Cape Wrath Hotel Unlimited

Job No. T058

December 2022





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SITE SPECIFIC FLOOD RISK ASSESSMENT

PROPOSED CEMETERY DEVELOPMENT AT CITY WEST, SAGGART, COUNTY DUBLIN

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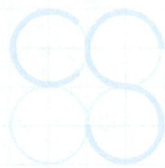
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BS 1192 FIELD

T058-CSC-ZZ-XX-RP-C-0002-P1

Job Ref.	Author	Reviewed By	Authorised By	Issue Date	Rev. No.
T058	RFM	GL	GL	08.12.2022	P4
T058	RFM	GL	GL	23.11.2022	P3
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T058	RFM	GL	GL	14.11.2022	P1
T058	RFM	GL	GL	04.03.2021	P0



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1.0 INTRODUCTION

Cronin & Sutton Consulting Engineers (CS Consulting) have been commissioned by Tetrarch Capital Limited to prepare a Site-Specific Flood Risk Assessment to accompany a planning application for a proposed development at Gartars Lane, Saggart, County Dublin.

In preparing this report, CS Consulting has made reference to the following:

- South Dublin Development Plan 2022–2028;
(including Strategic Flood Risk Assessment)
- Greater Dublin regional Code of Practice for Works;
- Office of Public Works Flood Maps;
- Department of the Environment Flooding Guidelines;
- Geological Survey of Ireland Maps;
- Local Authority Drainage Records.

The Flood Risk Assessment is to be read in conjunction with the engineering drawings and documents submitted by CS Consulting and with the various additional information submitted by the other members of the design team, as part of the Planning Submission.

2.0 SITE LOCATION AND PROPOSED DEVELOPMENT

2.1 Site Location

The proposed development site is located in City West, Saggart, County Dublin. The site is located in the administrative jurisdiction of South Dublin County Council and has a total area of circa 13.45 ha.



Figure 1 – Location of proposed development site
(map data and imagery: EPA, OSi, OSM Contributors, Google)

The location of the proposed development site is shown in **Figure 1** above; the indicative extents of the development site, as well as relevant elements of the surrounding road network, are shown in more detail in **Figure 2**.



Figure 2 – Site extents and context
(map data and imagery: NTA, EPA, OSM Contributors, Google)

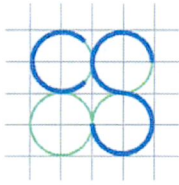
The site is bounded by the N7 motorway to the north and north-west, Garters Lane to the east, and an existing City West Complex to the south and south-west.

2.2 Existing Site Condition

The subject site is currently configured to be a golf course, with associated water courses and golf relief features.

2.3 Description of the Proposed Development

The development will consist of a cemetery including: 8,047 No. traditional burial plots; Columbarium walls; 1 No. single storey reception building (214.7m² Gross Floor Area (GFA)) comprising a reception, 1 No. office, 1 No. reception store, WC, kitchenette with photovoltaic (PV) solar panels at



roof level; and the provision of an ancillary maintenance shed, bin and battery storage structures.

The development includes a new vehicular access road from Garters Lane to the N7/M7 Naas Road, with 2 No. vehicular access points serving the proposed cemetery; 110 No. car parking spaces (25 No. spaces to the east of the reception building and 85 No. within overflow car park areas to the south of the development); 8 No. bicycle parking stands; and all associated hard and soft landscape and boundary treatment works including the reshaping of an existing lake and provision of a footbridge; provision of SUDS measures, associated lighting, associated signage, site services (foul and surface water drainage and water supply); and all other associated site excavation, infrastructural and site development works above and below ground.

Refer to Tom Philips & Associates submission with this application for a detailed breakdown of the proposed development.

3.0 LEVEL OF SERVICE

There is an existing inherent risk of any flood event occurring during any given year. Typically, this likelihood of occurrence has traditionally been expressed as a 1-in-100 chance of a 100-year storm event happening in any given year.

A less ambiguous expression of probability is the Annual Exceedance Probability (AEP), which may be defined as the probability of a flood event being exceeded in any given year. Therefore, a flooding event with a 1-in-100-year return period has a 1% AEP. Similarly, a 100% AEP can be expressed as a 1-in-1-year event.

The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Flood Risk Management Guidelines), published in 2009 set out the best practice standards for flood risk assessment in Ireland. These are summarised in **Table 1** below (Table 8.1 from Flood Risk Management Guidelines document).

Table 1 – Summary of Level of Service: Flooding Source

Development Category	Flooding Source		
	Drainage	River	Tidal/Coastal
Residential	1% AEP	0.1% AEP	0.1% AEP
Commercial	1% AEP	1% AEP	0.5% AEP
Water-compatible (docks, marinas)	-	>1% AEP	>0.5% AEP

Under these guidelines a proposed development site has first to be assessed to determine the flood zone category it falls under.

It is a requirement of South Dublin County Council and the Flood Risk Management Guidelines that the predicted effects of climate change are

incorporated into any proposed design. **Table 2** below indicates the predicted climate change variations.

Table 2 – Predicted climate change variations

Design Category	Predicted Impact of Climate Change
Drainage	20% Increase in rainfall
Fluvial (river flows)	20% Increase in flood flow
Tidal / Coastal	Minimum Finished Floor Level 4.0 – 4.15m AOD

The flooding guidelines categorise the risks associated with flooding into three areas: Zones A, B, and C. This categorisation is indicated below.

- **Zone A** – High Probability of Flooding
Where the average probability of flooding from rivers and sea is highest (greater than 1% annually or 1 in 100 for river flooding or 0.5% annually or 1 in 200 for coastal flooding).
- **Zone B** – Moderate Probability of Flooding
Where the average probability of flooding from rivers and sea is moderate (risk between 0.1% annually or 1 in 1000 years and 1% annually or 1 in 100 years for river flooding, and between 0.1% or 1 in 1000 years and 0.5% annually or 1 in 200 years for coastal flooding).
- **Zone C** – Low Probability of Flooding
Where the probability of flooding from rivers and sea is moderate (risk is less than 0.1% annually or 1 in 1000 years for both rivers and coastal flooding).

In accordance with the Flood Risk Management Guidelines, dwellings are classified as 'highly vulnerable developments' and commercial developments are classified as 'less vulnerable developments'.

A review of SDCC Development Plan Strategic Flood Risk Assessment shows the subject site to be located in **Flood Zone C**. See **Appendix A**.

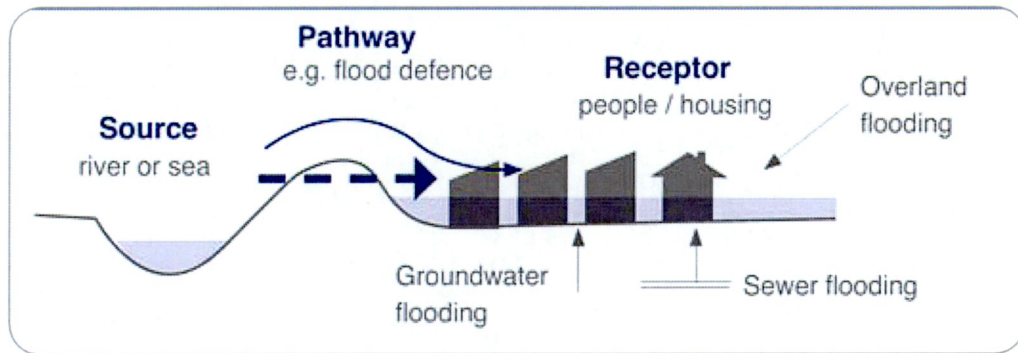


Figure 3 – Source-pathway-receptor model
(The Planning System and Flood Risk Management Guidelines)

The Flood Risk Management Guidelines have developed an 'appropriateness' matrix for various developments and their potential risk factor. The table indicates if further analysis is required in the form of a justification test. **Table 3** below outlines the conditions that require a justification test.

Table 3 – Flood Zone vs. Justification Test Matrix

Development Category	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable Development	Justification Test Required	Justification Test Required	Appropriate
Less Vulnerable Development	Justification Test Required	Appropriate	Appropriate
Water-compatible Development	Appropriate	Appropriate	Appropriate

As noted above, the subject site is located within **Flood Zone C**. As such, no justification test is required.

4.0 FLOOD RISK AND MITIGATION MEASURES

4.1 Fluvial Flooding

A review of the Office of Public Works flooding records database (www.floodmaps.ie) for the area does not indicate historical flooding at the site. See the OPW map-report included in **Appendix B**.

Flood mapping developed as part of the recently adopted Development Plan, 2022 – 2028. Gives predicted flood mapping for fluvial events. The mapping does not indicate the subject lands is located within a fluvial flood zone. See **Appendix C** for a copy of the fluvial flood maps.

4.2 Tidal Flooding

The sites location is such that it is not affected by tidal water bodies and as such tidal flooding is negligible.

4.3 Pluvial Flooding

Pluvial flooding is flooding which has originated from overland flow resulting from high intensity rain fall. From a review of the OPW flood maps there are no records of flood events due to high rainfall events in the area. However, mapping prepared for the current Development Plan does indicate part of the subject lands, located around the existing artificial pond may experience pluvial flooding. This is due to the current topography of the site as the current pond is part of a local 'water feature' for the current golf course. Post development this pond will be retained as a local water feature and the level of the water will have the capacity to contain any excess storm water generated locally, thereby containing any pluvial rainfall. See **Appendix D** for South Dublin County Council Pluvial map.

4.4 Potential for Proposed Development to Contribute to Off-Site Flooding

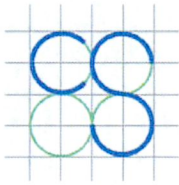
The proposed development will require attenuation to be provided. Attenuation will be sized for a 1-in-100 year extreme storm event increased by 20% for the predicated effects of climate change. The attenuation will release the storm water in a controlled manner after the peak storm duration has passed. By restricting the flow, the likelihood of the proposed development adversely affecting the public drainage system or contributing to downstream flooding is mitigated. Please refer to Engineering Services Report (under separate cover).

4.5 Existing Off-Site Drainage

It is the understanding of CS Consulting that at present there are no issues with the local drainage arrangements. The subject lands will only discharge a restricted low flow into the public system thereby reducing the hydraulic pressure on the public network during extreme rainfall events. Notwithstanding this, the development site shall be super-elevated above to the adjacent lands to prevent the egress of off-site drainage onto the site.

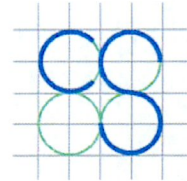
4.6 Groundwater Flooding

According to the Geological Survey of Ireland, GSI, interactive maps, the subject site is underlain with *Dark Limestone & Shale*. The area is listed as overlaying a locally important aquifer which has bedrock which is *moderately productive only in local zones*. The groundwater vulnerability assessment of the site shows that the vulnerability of groundwater in the area is *high*. The GSI data base does not indicate that the subject lands would be susceptible to groundwater flooding. See **Appendix E** for GSI mapping information for background groundwater & geology data for the subject lands.



5.0 CONCLUSIONS

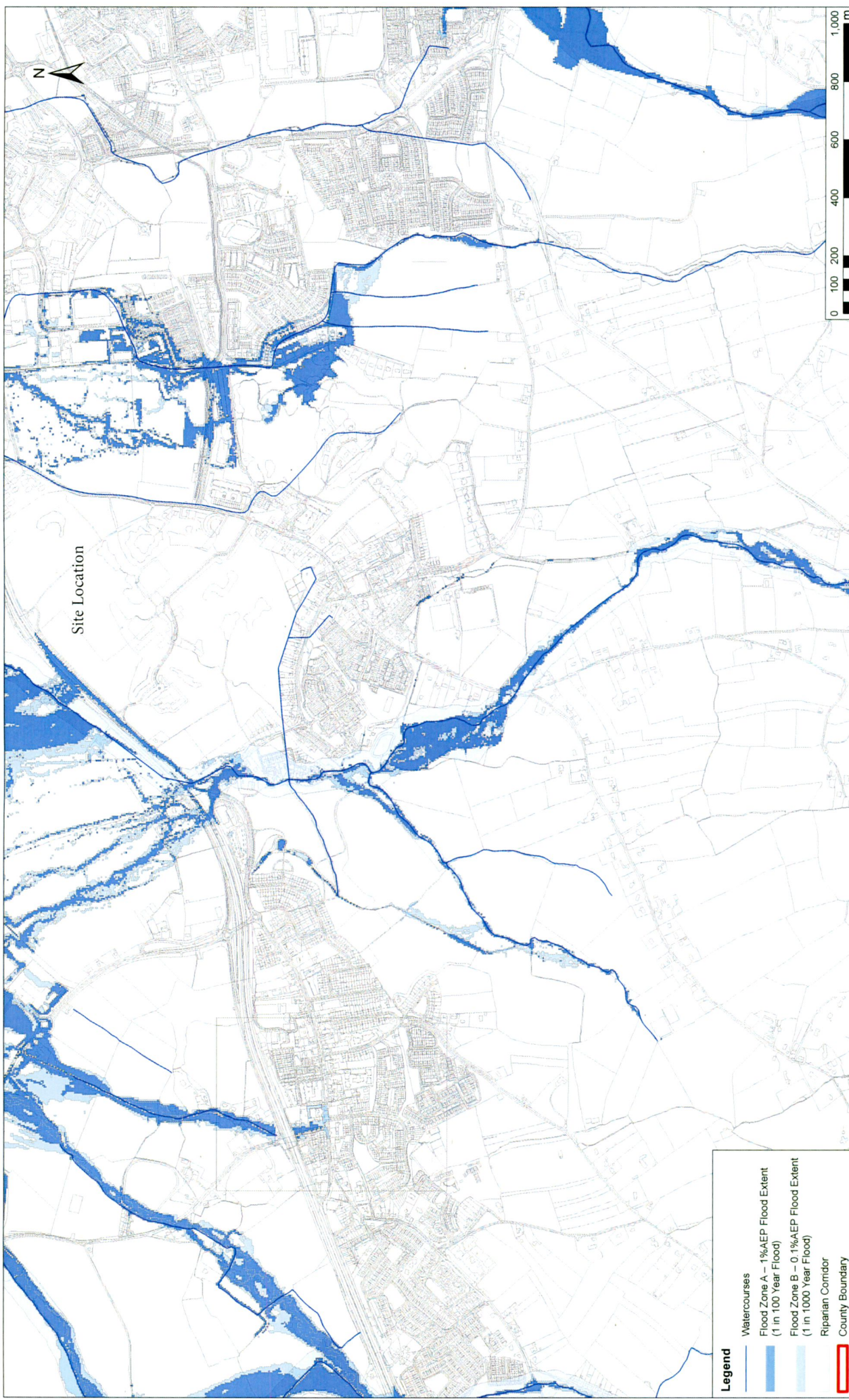
- The site historically has no recorded flood events, as noted in the OPW's flood maps. The South Dublin County Council Development Plan Strategic Flood Risk Assessment maps indicate that the development site is located outside the 0.1% AEP Zone.
- Mapping of predicted tidal, and fluvial flooding extents shows that these will not affect the development site.
- Pluvial flooding is indicated on site due to the presence of an existing pond, used as a water feature. This pond is to be re-engineered and retained. All pluvial waters will be contained within this pond.
- The proposed development's surface water drainage network shall infiltrate to ground within the site boundary of the site and incorporates attenuation storage to cater for a 1-in-100-year storm event, plus a 20% allowance for climate change effects. The proposed development is therefore not considered to increase the site's potential to contribute to off-site flooding.
- The proposed development shall not discharge any stormwater to the public drainage network and therefore shall not have any adverse effect on its operation.
- The likelihood of onsite flooding from the hydrogeological ground conditions is deemed to be minor and within acceptable levels.



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Appendix A

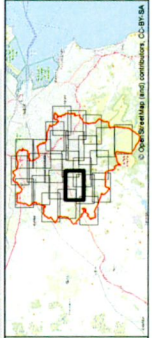
South Dublin County Council Development Plan Flood Maps



Site Location

- Legend**
- Watercourses
 - Flood Zone A – 1% AEP Flood Extent (1 in 100 Year Flood)
 - Flood Zone B – 0.1% AEP Flood Extent (1 in 1000 Year Flood)
 - Riparian Corridor
 - County Boundary

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Project Information

Project Name	SDCC County Development Plan Strategic Flood Risk Assessment		
Drawing No.	SFRFA Flood Zone Mapping Sheet 14 of 20		
Drawing Number	SDSFRFA - ROD - EVE - SW_AE - DR - ENV - 40014	Scale	1:6,000
Sheet No.	14	Date	April 2021
Job No.	20_026	Rev.	R01

Client Information

Client Name	Areas Housing Area Road, Sandymount, Dublin 6, Ireland		
Contact	T: +353 (0) 1 294 0800		
Website	www.frod.ie		
Submitter	Client	Designer	Checker
LA	WV	WV	JPR

Revision History

No.	Rev.	Date	By	CHKD	Appr'd
1	Final Issue	28/07/2021	LA	WV	JPR

Approval

Checked	WV
Approved	JPR

FIROD
 CONSULTING ENGINEERS
 CIVIL - STRUCTURAL - TRANSPORTATION - ENVIRONMENTAL

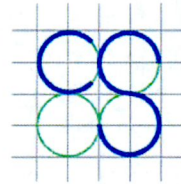
ROUGHAN & O'DONOVAN

FINAL
 SDCC County Development Plan Strategic Flood Risk Assessment
 SFRFA Flood Zone Mapping Sheet 14 of 20
 SDSFRFA - ROD - EVE - SW_AE - DR - ENV - 40014
 Scale 1:6,000 Date: April 2021 Job No: 20_026 Rev: R01
 Areas Housing Area Road, Sandymount, Dublin 6, Ireland
 T: +353 (0) 1 294 0800 www.frod.ie
 Submitter: Client Designer: Checker: Approved: JPR
 LA WV WV
 No. Rev. Date By CHKD Appr'd
 1 Final Issue 28/07/2021 LA WV JPR
 Checked: WV Approved: JPR
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Appendix B

Office of Public Works Historic Flood Maps

Past Flood Event Local Area Summary Report

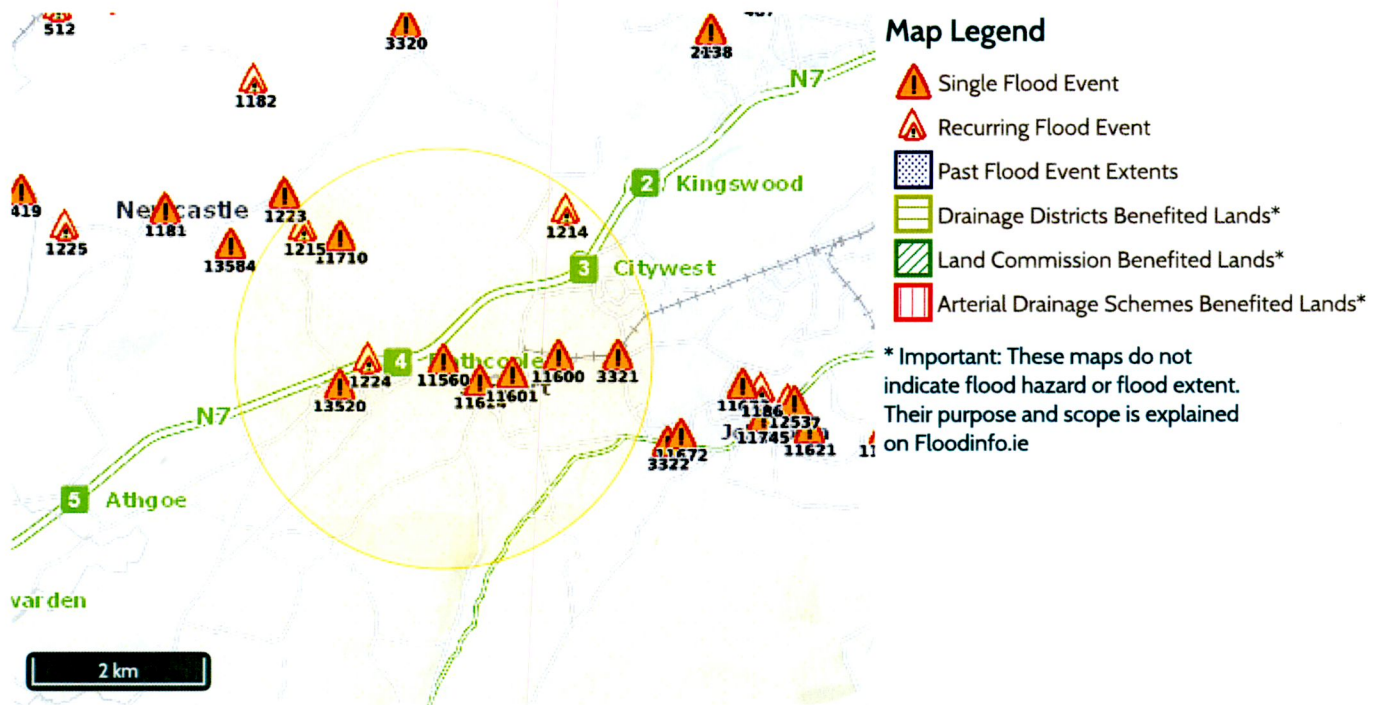


OPW Oifig na nOibreacha Poiblí
Office of Public Works

Report Produced: 14/11/2022 14:59

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

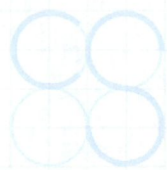
This report has been downloaded from www.floodinfo.ie (the "Website"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.



11 Results

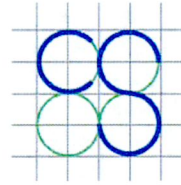
Name (Flood_ID)	Start Date	Event Location
1. Fortunestown Lane Nov 2000 (ID-3321) Additional Information: Reports (1) , Press Archive (0)	06/11/2000	Approximate Point
2. Baldonnell Barneys Lane Recurring (ID-1214) Additional Information: Reports (2) , Press Archive (0)	n/a	Approximate Point
3. Newcastle Greenoge Recurring (ID-1215) Additional Information: Reports (2) , Press Archive (0)	n/a	Approximate Point
4. Rathcoole Bridge recurring (ID-1224) Additional Information: Reports (2) , Press Archive (4)	n/a	Approximate Point
5. Flooding at Avoca Road, Saggart on 24th Oct 2011 (ID-11560) Additional Information: Reports (1) , Press Archive (0)	23/10/2011	Exact Point
6. Flooding at Fortunestown Lane, Citywest, Co. Dublin on 24th Oct 2011 (ID-11600) Additional Information: Reports (1) , Press Archive (0)	23/10/2011	Approximate Point

Name (Flood_ID)	Start Date	Event Location
7.  Flooding at Garter Lane, Saggart, Co. Dublin on 24th Oct 2011 (ID-11601) Additional Information: Reports (1) Press Archive (0)	23/10/2011	Approximate Point
8.  Flooding at Mill Road, Saggart, Co. Dublin on 24th Oct 2011 (ID-11624) Additional Information: Reports (1) Press Archive (0)	23/10/2011	Approximate Point
9.  Flooding at Greenogue Business Park, Rathcoole, Co. Dublin on 24th Oct 2011 (ID-11710) Additional Information: Reports (1) Press Archive (0)	23/10/2011	Exact Point
10.  Flooding at Rathcoole on 07/03/2016 (ID-13520) Additional Information: Reports (0) Press Archive (0)	07/03/2016	Approximate Point
11.  Flooding at Saggart on 07/03/2016 (ID-13521) Additional Information: Reports (0) Press Archive (0)	07/03/2016	Approximate Point



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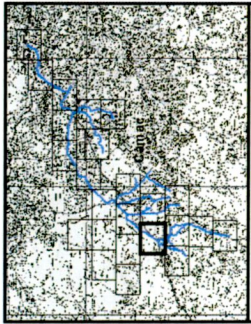
ORTEL P.



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Appendix C

South Dublin County Council Fluvial Flood Maps



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

- Legend**
- 10% Fluvial AEP Event
 - 1% Fluvial AEP Event
 - 0.1% Fluvial AEP Event
 - Modelled River Centreline
 - AFA Extents
 - Embankment
 - Wall
 - Defended Area
 - Standard of Protection of Flood Defence (Walls / Embankments)
 - Flood Defence
 - Standard of Protection of Flood Defence (Walls / Embankments)
 - Node Point
 - Node ID
 - Node Label

FINAL

REV: 01
NOT: Top label updated (Pg 21)
Removal of Col. Area (Pg 21)

DATE: 13/11/2017

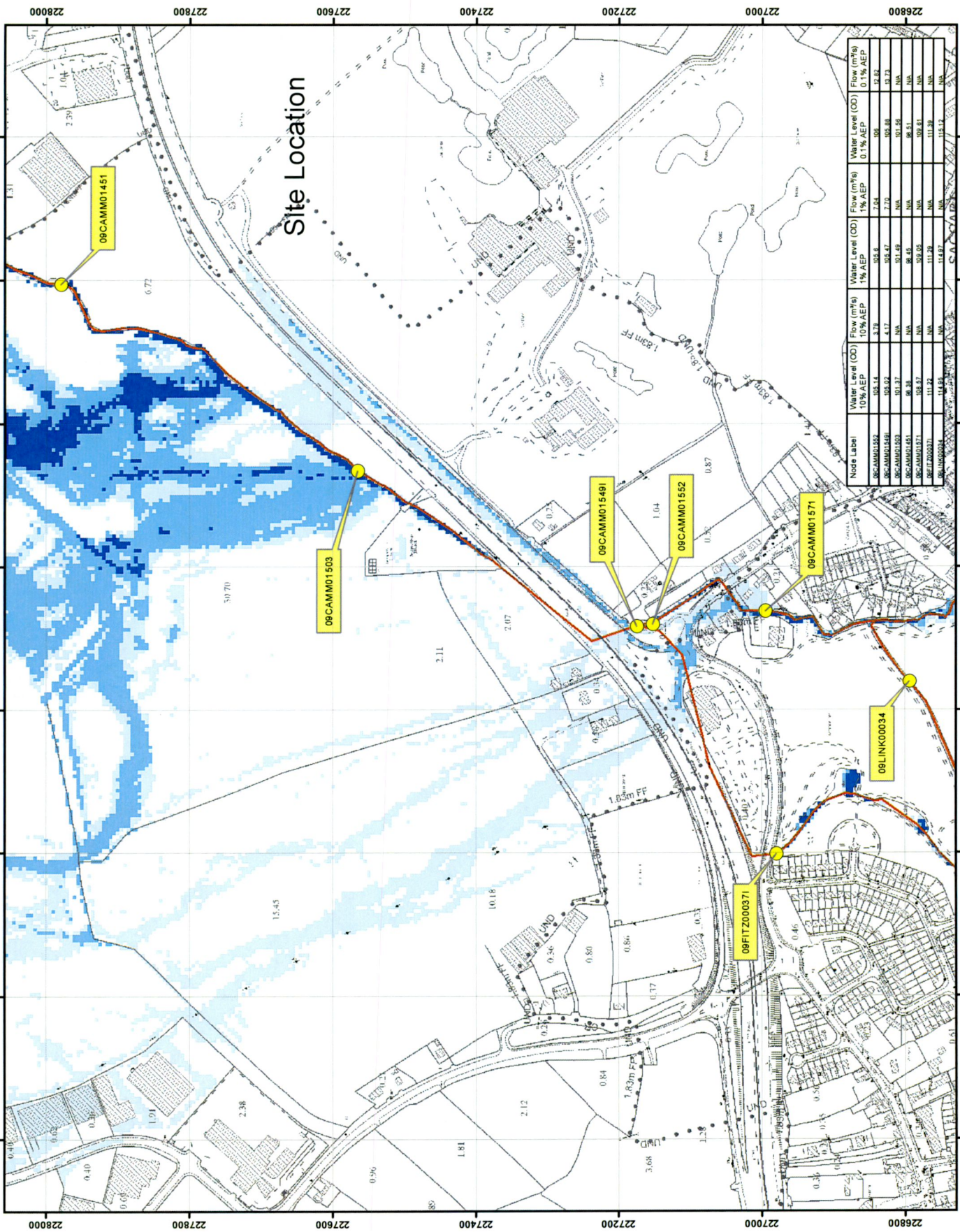


Elmwood House
74 Bourke Road
F-4401 28.50 66914
Ballybrack
Co. Dublin
E: rps@rpsgroup.com

Map:

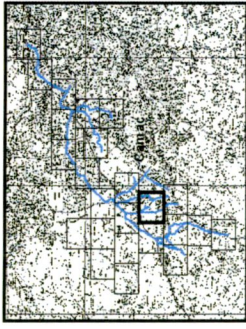
Map Type:	EXTENT
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By:	C-McG
Date:	13 November 2017
Checked By:	A.S.
Date:	13 November 2017
Approved By:	S.P.
Date:	13 November 2017

Map Series: Page 5 of 24
Drawing Scale: 1:5,000 @A3



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
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09CMM01451	59.52	4.17	59.87	7.70	59.88	13.73
09CMM01548	59.37	N/A	59.45	N/A	59.51	N/A
09CMM01552	59.38	N/A	59.55	N/A	59.81	N/A
09CMM01571	59.57	N/A	59.55	N/A	59.81	N/A
09LINK00034	111.52	N/A	111.79	N/A	113.59	N/A
09FITZ000371	111.52	N/A	114.87	N/A	115.12	N/A





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

- Legend**
- 10% Fluvial AEP Event
 - 1% Fluvial AEP Event
 - 0.1% Fluvial AEP Event
 - Modelled River Centreline
 - AFA Extents
 - Embankment
 - Wall
 - Defended Area
 - Standard of Protection of Flood Defence (Walls / Embankments)
 - Node Point
 - Node ID
 - Node Label

FINAL

REV: 01 NO Topo (last update (Fig 2)) Removal of Def. Area (Fig 21) DATE: 10/11/2017

EASTERN CFRAM STUDY

OPW **RPS**

The Office of Public Works
100 Main Street
Co. Meath

Elmwood House T: +44(0) 28 90 697914
Boalder Road W: +44(0) 28 90 60606
BT12 6Z2 E: r.ehlers@rps-group.com

Map: Camac Fluvial Flood Extents

Map Type: EXTENT

Source: FLUVIAL

Map Area: HPW

Scenario: CURRENT

Drawn By: C.McG. Date: 13 November 2017

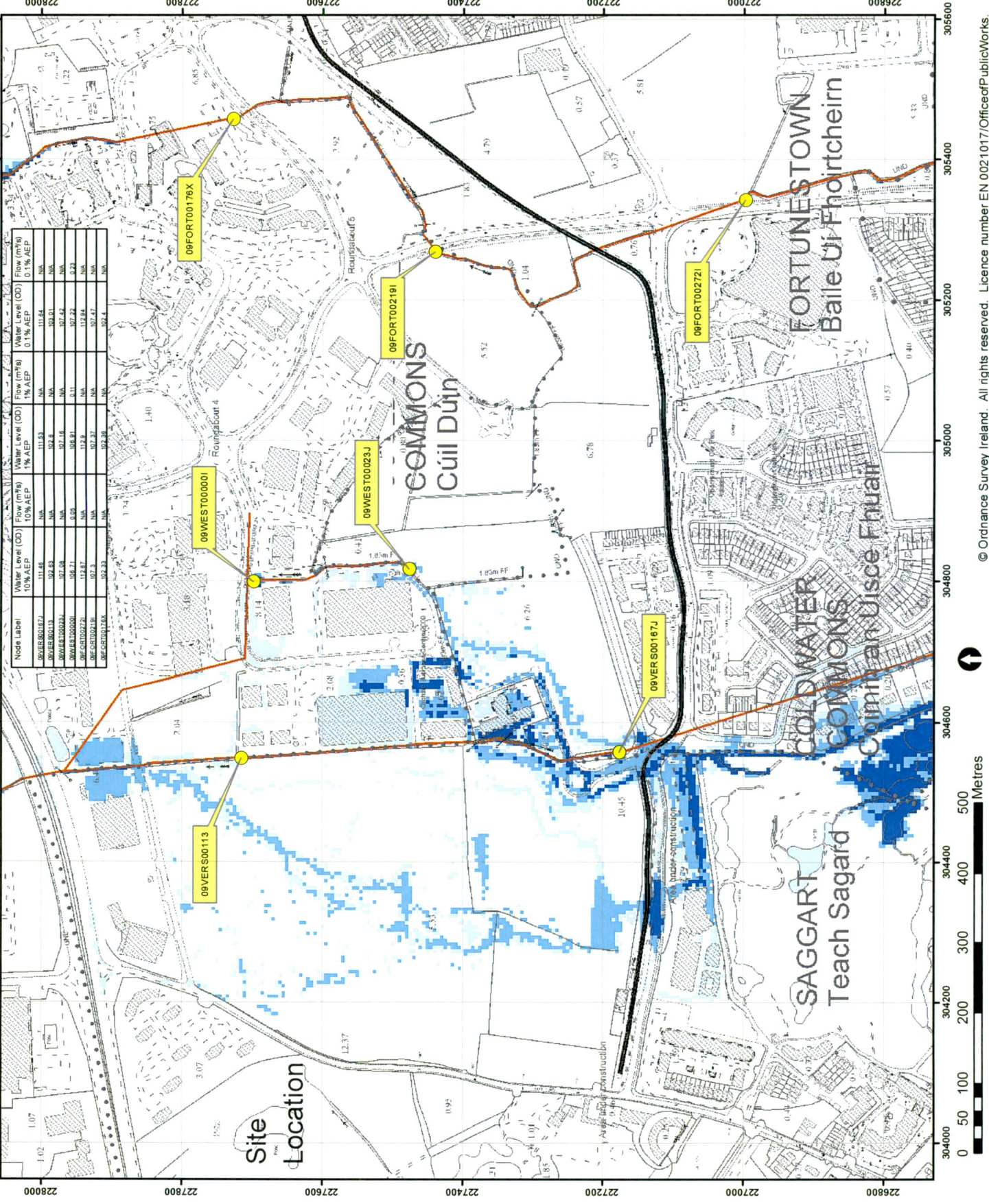
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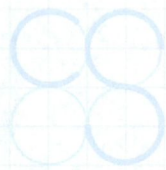
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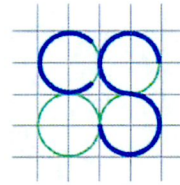
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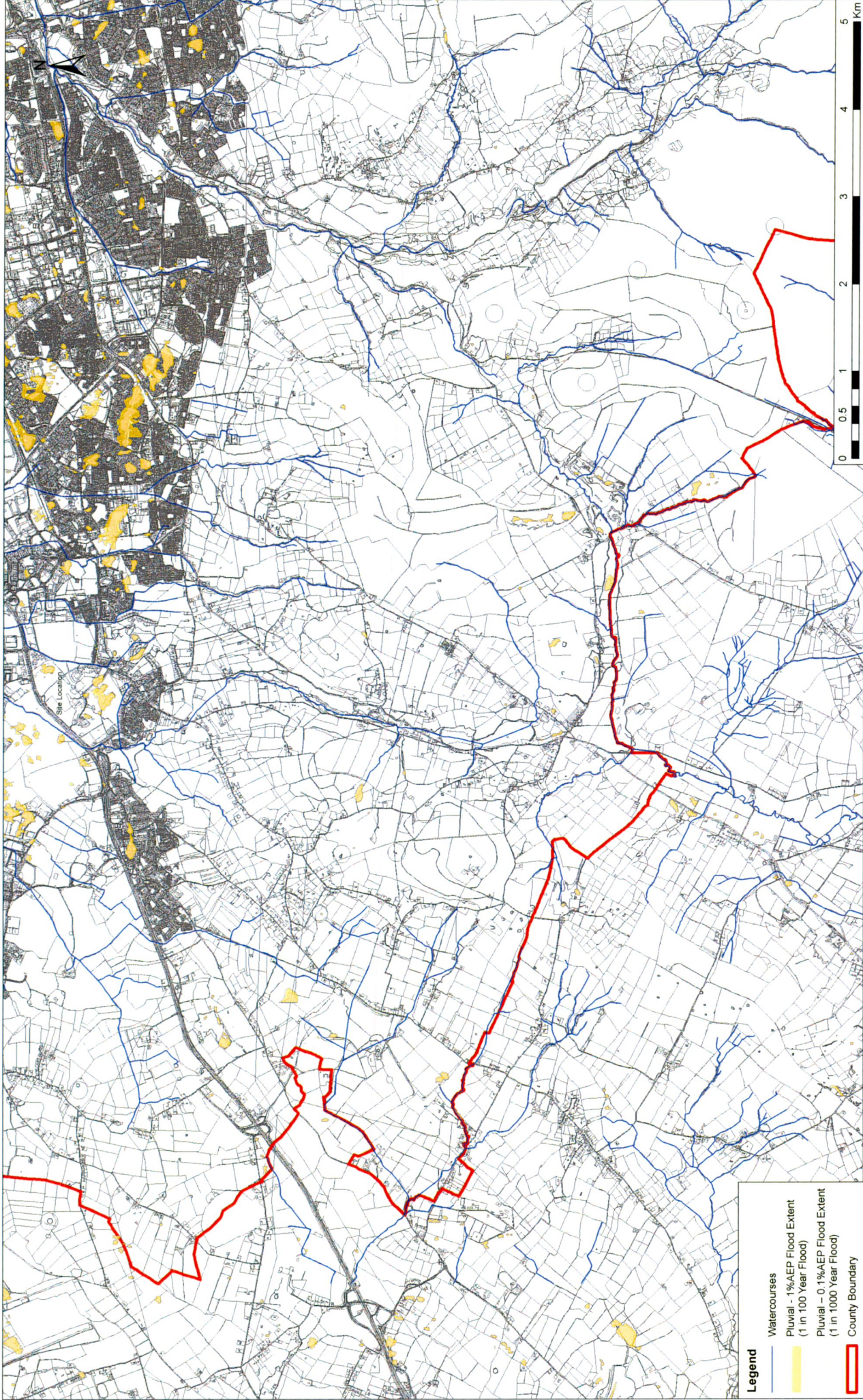
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Appendix D:

South Dublin County Council Pluvial Flood Maps



Legend

- Watercourses
- Pluvial - 1%AEP Flood Extent (1 in 100 Year Flood)
- Pluvial - 0.1%AEP Flood Extent (1 in 1000 Year Flood)
- County Boundary

Area: House, Sandford, Sandford, Dublin 18, Ireland
 Phone: +353 (0)1 294 0800
 www.rod.ie

FIROD
 KOUHAN & O'DONOVAN
 Consulting Engineers
 Civil - Structural - Transportation - Environmental

Drawn: LA Checked: JPR
 Design: WW Checked: JPR
 Project: WW Approved: JPR

Project Stage: **FINAL**

Project Title: SDCS County Development Plan Strategic Flood Risk Assessment

Drawing Title: Indicative Pluvial Flood Mapping Sheet 2 of 4

Project Name: SDFRA - ROD - EWE - SW AE - DR - ENV - 40102

Scale: A1: 1:20,000 Date: April 2021 Job No: 201748 Rev: P01

Drawn: LA Checked: JPR Date: 30/07/2021 By: WW Project: WW

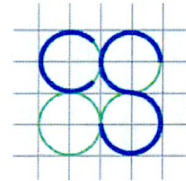
No. P01 First Issue Revision Reason

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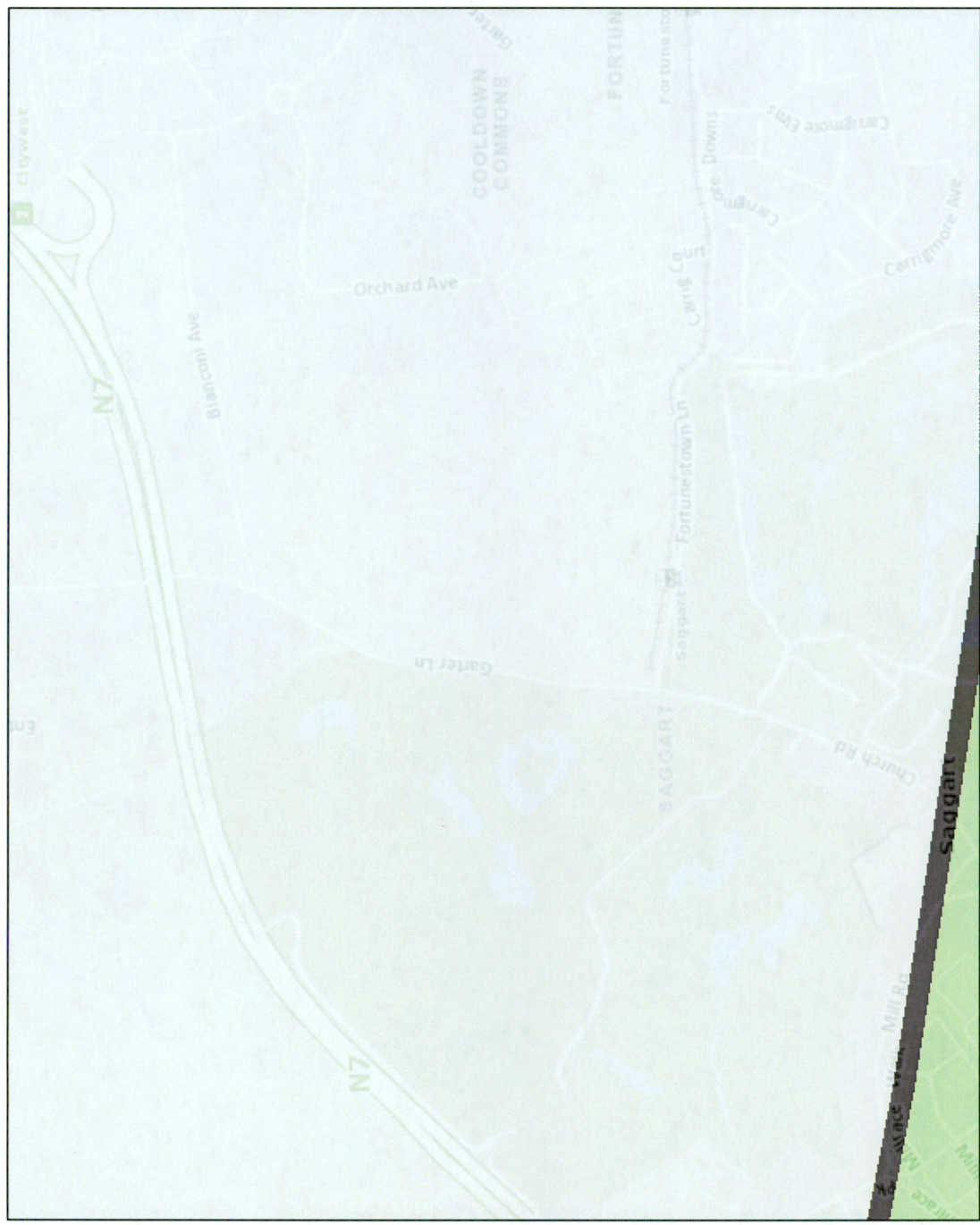


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Appendix E:

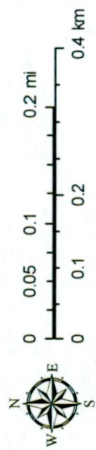
Geological Survey of Ireland, (GSI) Maps

Geological Survey Ireland Public Data



Map Centre Coordinates (ITM) 704,113 727,445
3/26/2020, 6:08:17 PM

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Legend Structural Symbols 100K ITM 2018

- <all other values>
- ↑ Dip of bedding or main foliation, old
- ↓ GSI data
- ↔ First foliation parallel to bedding
- ↗ Foliation trend, Thorr and Rosses Granites
- ↘ Horizontal Bedding
- ↖ Strike and dip of bedding, right way up
- ↗ Strike and dip of bedding, way up
- ↘ unknown
- ↖ Strike and dip of first foliation
- ↗ Strike and dip of overturned bedding
- ↘ Strike and dip of second foliation
- ↖ Strike and dip of third foliation
- ↗ Strike and plunge of first generation fold
- ↘ Strike and plunge of second generation
- ↖ fold axis
- ↗ Strike and plunge of third generation fold
- ↘ axis
- ↖ Strike of vertical bedding/foliation
- ↗ Strike of vertical first foliation

Bedrock Outcrops
100 ITM 2018

Bedrock Linework 100k ITM 2018

- ◆ Anticlinal Axis
- ◆ Antiformal axis
- Aquifer Boundary
- - - Area
- Coal seam
- Dyke
- Fault

- Ghost Line
- Goniatite marine band (R1-R4)
- Lithological boundary
- Offshore
- Metadolomite sheet, mainly sills
- Paleogene/ Tertiary Dyke
- Synclinal Axis
- Synformal axis
- Tectonic Slide, barbs on hanging-wall
- Thin stratigraphical unit, diagrammatic
- Thrust, barbs on hanging-wall side
- Tuff band
- Unconformity, dots on younger side
- X-Section

Geological Survey Ireland Public Data

Legend

- Group Scheme
 - Preliminary Source
 - Protection Areas
- Gravel Aquifer**
 - Locally important gravel aquifer
 - Regionally important gravel aquifer
- National Groundwater Vulnerability Ireland**
 - Rock at or near Surface or Karst Extreme
 - High
 - Moderate
 - Low
 - Water

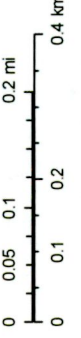


Scale: 1:10,000

Geological Survey Ireland

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Flood Maps

Layers

Tools

Search

Active Layers

+ Add Layer

National Indicative Fluvial Mapping - Present Day Off

CFRAM PDF Maps (Printable)

Geological Survey Ireland (GSI) Groundwater Flooding Probability Maps

GSI Groundwater Flooding - Low Probability Off

Low Probability

GSI Groundwater Flooding - Medium Probability Off

Medium Probability

GSI Groundwater Flooding - High Probability Off

High Probability

Past Flood Events

