Our Case Number: ABP-313855-22

Planning Authority Reference Number: SD22A/0094

An Bord Pleanála

South Dublin County Council
Planning Department
County Hall
Tallaght
Dublin 24

DELIVERED Siniú Riach. / Sig Req. RL 5177 6270 8IE

Date: 01 August 2023

Re: House, new vehicular/pedestrian entrance and associated site works
42, Whitehall Road, Terenure, Dublin 12, D12 YR60

Dear Sir / Madam,

I have been asked by An Bord Pleanála to refer to the above mentioned appeal.

The Board is of the opinion that, in the particular circumstances of this appeal, it is appropriate in the interests of justice to request you to make submissions or observations in relation to the enclosed submission dated 16th July, 2023 received from SONNA Architects on behalf of Derek Glennon.

In accordance with section 131 of the Planning and Development Act, 2000, (as amended), you are requested to make any submissions or observations that you may have in relation to this enclosure **on or before 21st August 2023.** The Board cannot consider comments that are outside the scope of the matter in question. Your submission in response to this notice must be received by the Board not later than **5:30pm on the date specified above.**

If no submission or observation is received before the end of the specified period, the Board will proceed to determine the appeal without further notice to you, in accordance with section 133 of the 2000 Act.

Please quote the above appeal reference number in any further correspondence.

Yours faithfully,

LAND USE, PLANNING
& TRANSPORTATION DEPT.
02 AUG 2023

Mary Tucker
Executive Officer
Direct Line: 01-8737132

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AN BORD PLEANÁLA
LDG-
ABP-
17 JUL 2023
Fee: € Type:
Time: 5pm By: Hand

ABP Case Number:	**ABP-313855-22**
Planning Authority Ref:	**SD22A/0094**
Applicant:	**Derek Glennon**

Date: 16 July 2023

Dear Mary Tucker (An Bord Pleanala),

Further to the letter dated, 28 July 2023, please find attached the requested **Site Specific Flood Risk Assessment Report.**

Please refer to the report in its entirety, but we would like to draw attention to the following:

- The site is located within Flood Zone A and Flood Zone B, however it is also noted that while there are risks of the surrounding areas being flooded there are also mitigation measures which can be utilised to prevent these risks to the proposed development. Several of these mitigation measures are outlined in the Flood Risk Assessment.

- Further measures which can address the risk of flooding could include raising the internal ground floor FFL to an appropriate level, and to create a considered landscape approach, as outlined in the report.

- It is important to note that considered design strategies can overcome the flood risks associated with the site.

- Consideration of the future River Dodder Flood Alleviation Scheme should also be taken into account, as outlined in the report.

- The applicant seeks the proposed house to live in close proximity to his elderly parents, who live at 42 Whitehall Road, located within the same Flood Zone, and subject to the same risks, as highlighted in the report. The proposed house will provide a home to the applicant and his young family, while the location will enable him to offer care and assistance to his elderly parents.

We therefore seek a considered approach to this appeal, based on the points raised above. We also welcome any design conditions An Bord Pleanala would like to impose, to enable the proposed development. Please therefore request any further information relating to the design or detailed mitigation measures if this will provide assistance in your review of this application.

Kind regards,
Benjamin Thomas

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Director
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SONAA Architects Limited
Company Number: 653096
SONAAA.com
Director: Benjamin Thomas ARB RIBA RIAI

July
2023

Site Specific Flood Risk Assessment

42 Whitehall Road,
Terenure
Dublin
D12YR60

ASH
Ecology & Environmental

Aisling Walsh M.Sc MCIEEM Trading as Ash Ecology & Environmental Ltd.
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Full membership of the CIEEM

ASH Ecology & Environmental

CIEEM
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PRACTICE 2023-2024

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1.0 Introduction

1.1 Background

This site-specific flood risk assessment was undertaken by Ash Ecology & Environmental Ltd (AEE) on behalf of Derek Glennon as part of a planning application to South Dublin County Council (planning reference: SD22A/0094). This relates to a proposed three bed detached sustainable two-storey house; a new vehicular/pedestrian entrance; two car driveway; all associated site boundaries, landscaping, drainage, new foul water connection, and ancillary works. The site is located at 42, Whitehall Road, Terenure, Dublin 12, D12 YR60, shown in Figure 1.

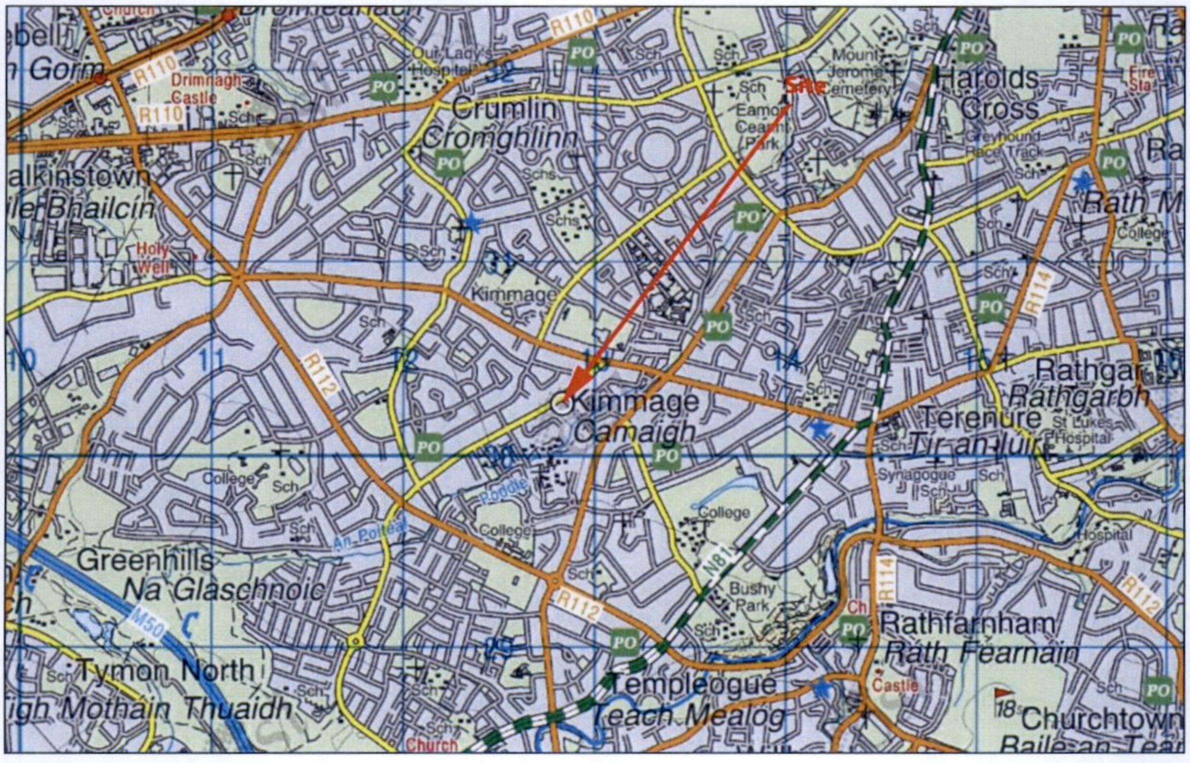


Figure 1 Site Location

1.2 Competency of Assessor

This report has been prepared by Aisling Walsh whose qualifications include MSc in Biodiversity and Conservation (TCD), B.Sc. (Hons) Zoology (NUIG) and B.Sc. in Applied Aquatic Science (GMIT) with relevant modules in Hydrology. Aisling is the Managing Director of Ash Ecology & Environmental Ltd and has over 16 years of experience providing environmental consultancy and environmental assessment services. She is a full member of the Chartered Institute of Ecological and Environmental Management (CIEEM). She has also provided input and reviewed Ecological and Environmental assessments for several EIS and EIAR including the hydrology and water quality assessment chapters of same. AEE is a registered practice of the CIEEM.

1.3 Site description

Figure 2 shows the site outline (0.039ha). The site lies within an existing residential site footprint among dense urban development on the junction of Whitehall Road and Whitehall Gardens. The proposed works total 96.7m² in area.

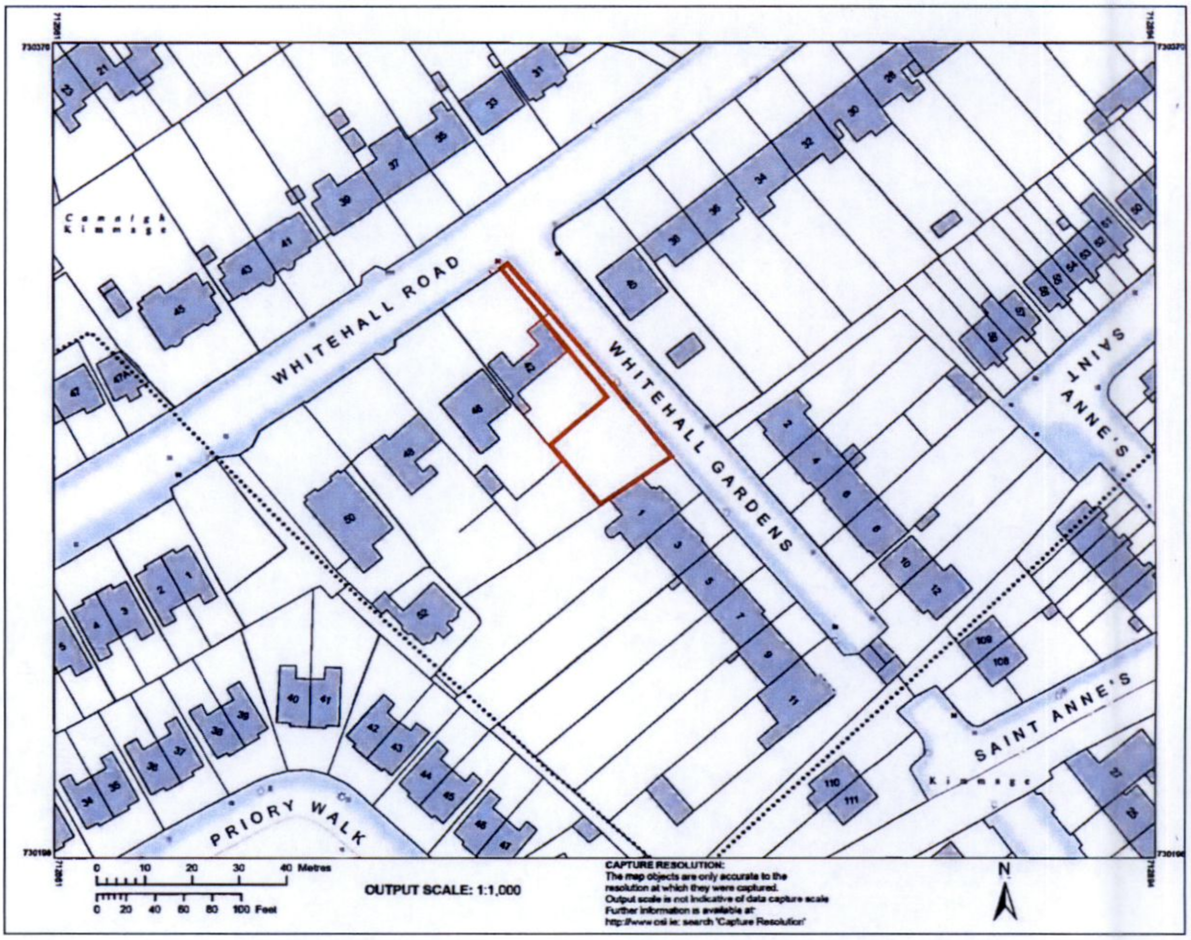


Figure 2 Aerial Site outline

1.4 Scope & Approach of Report

This study will focus on providing a risk assessment of flooding at the subject site. The scope of the study is specific to the proposed development only and its immediate surroundings. To fulfil the request, and in keeping with 'The Planning System & Flood Risk Management – Guidelines for Planning Authorities' (The FRM Guidelines), this study takes a 3-stage approach to assessing flood risk at the proposed development site. This will encompass:

Stage 1 Flood risk identification
Stage 2 Initial flood risk assessment
Stage 3 Detailed flood assessment

This SSFRA comprises Stages 1 and 2 involving both identification and initial assessment of flood risks related to the development and site using published modelled data.

1.5 Relevant hydrological and geological characteristics

1.5.1 Surface water

The nearest relevant watercourse to the site is the River Poddle, which lies 120 metres to the south, shown in Figure 3. The River Poddle rises in Cookstown, Tallaght and flows north-east through Tymon Park, following a circuitous route through Templeogue, Kimmage, Harold's Cross, Tenters and Temple Bar towards its confluence with the River Liffey at Father Matthew Bridge, 4.4km northeast of the site. The river catchment has become heavily urbanised in recent times, with the watercourse itself becoming regimented, altered, and concealed to suit local habitation. The downstream reach of the Poddle is heavily culverted, with the lower 4km flowing almost exclusively beneath the busy South Inner-City streets. The upstream catchment and median annual flood estimates (Qmed) for the River Poddle at the site location are shown in Figure 4.

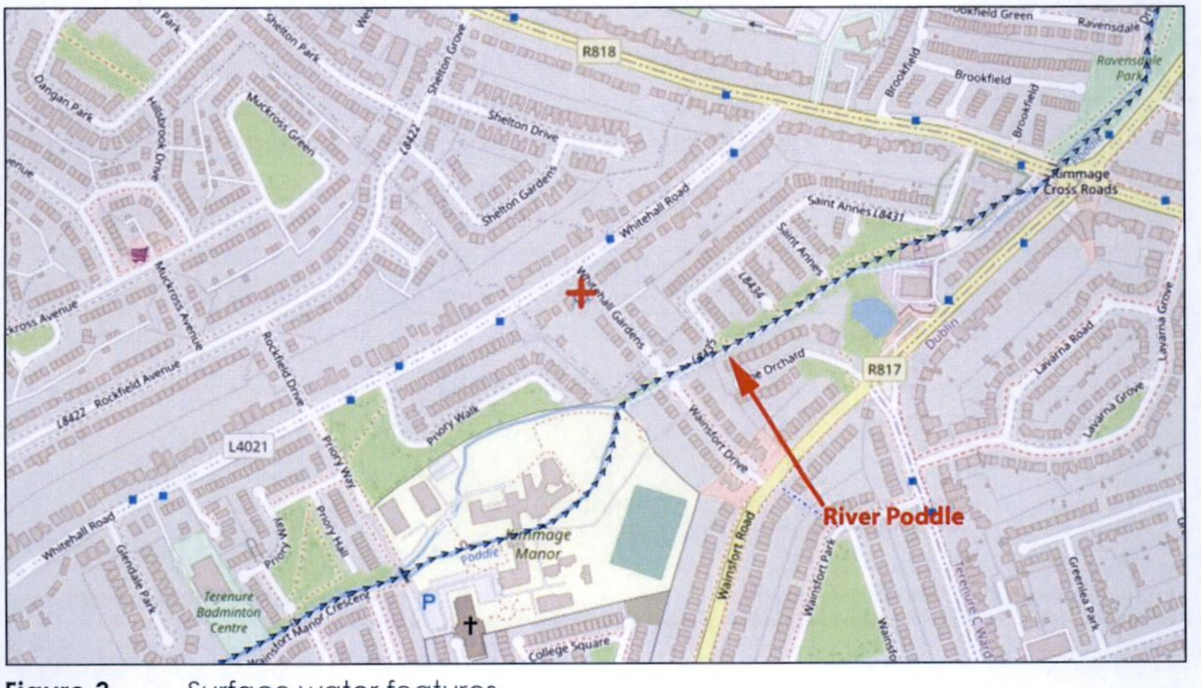


Figure 3 Surface water features

Subject site properties	
Location Number	09_1874_7
Contributing Catchment Area	6.009 km^2
BFISOIL	0.4971
SAAR	737.03 mm
FARL	0.985
DRAIND	0.851 km/km^2
S1085	6.9548 m/km
ARTDRAIN2	0
URBEXT	0.7641
Centroid distance	4.1438 km
Coordinates	[312887.998, 230161.9965]
QMED values	
PCD estimate	0.9211m^3/s
PCD urban estimate	2.1363m^3/s

Figure 4 Upstream catchment and Q_{med} data for River Poddle

1.5.2 Groundwater

The site lies on a locally important aquifer of 1309.36km². Geological survey data suggests no relevant groundwater features or karstic landforms near the site, see Figure 5. Groundwater vulnerability is recorded as low, see Figure 6.

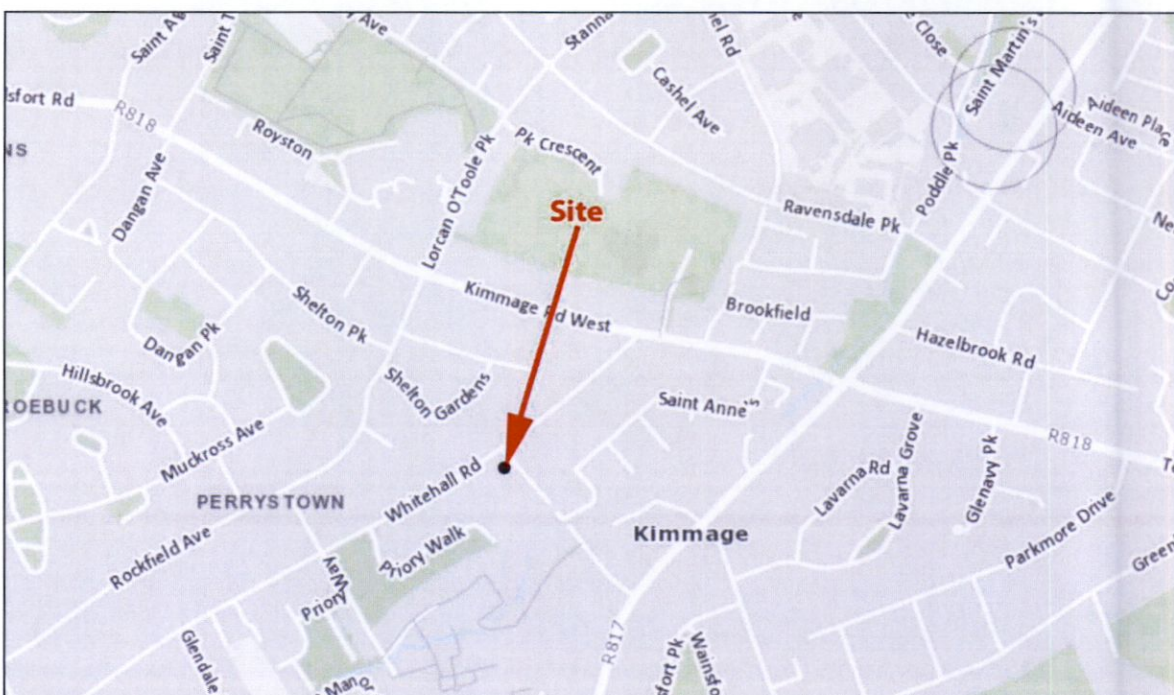


Figure 5 Groundwater features

Figure 6 Groundwater vulnerability

The average groundwater recharge at this location is 68mm/year (net recharge of 20%), see Figure 7.

Figure 7 Groundwater recharge

1.5.3 Bedrock Geology

The site is underlain by Lucan Formation-Dark limestone & shale (`calp), see Figure 8.

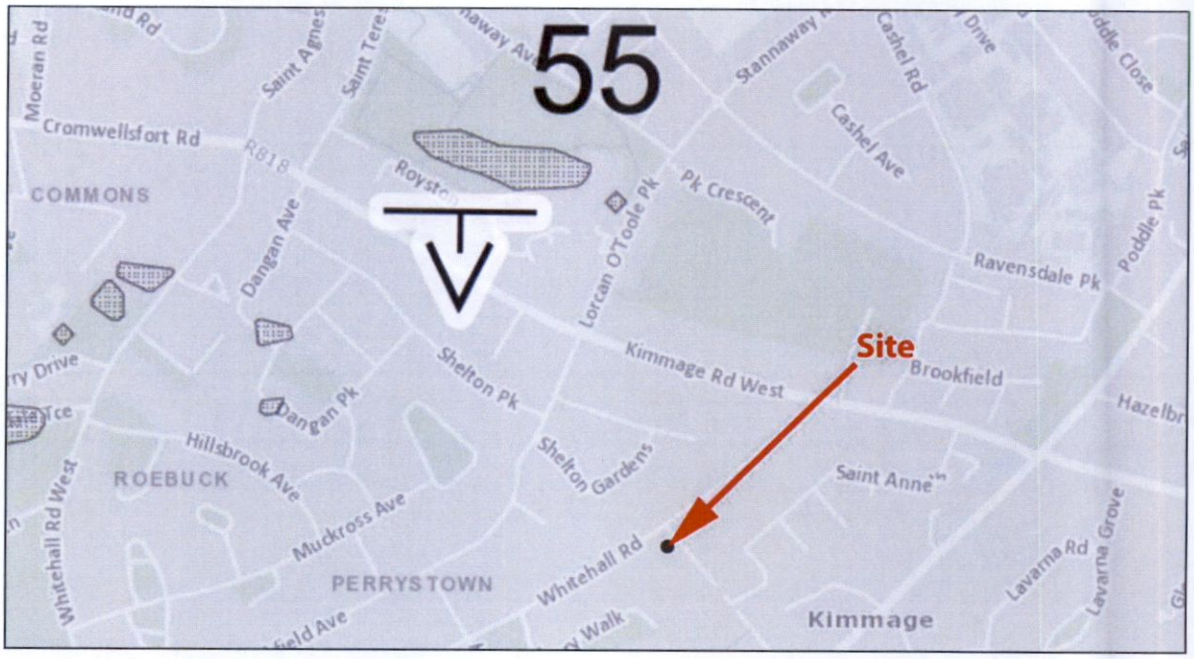


Figure 8 Bedrock map

1.5.4 Soil

Soil type at the site is made ground, see Figure 9. There is no indication of quaternary sediments or lacustrine deposits near the site, see Figure 10.

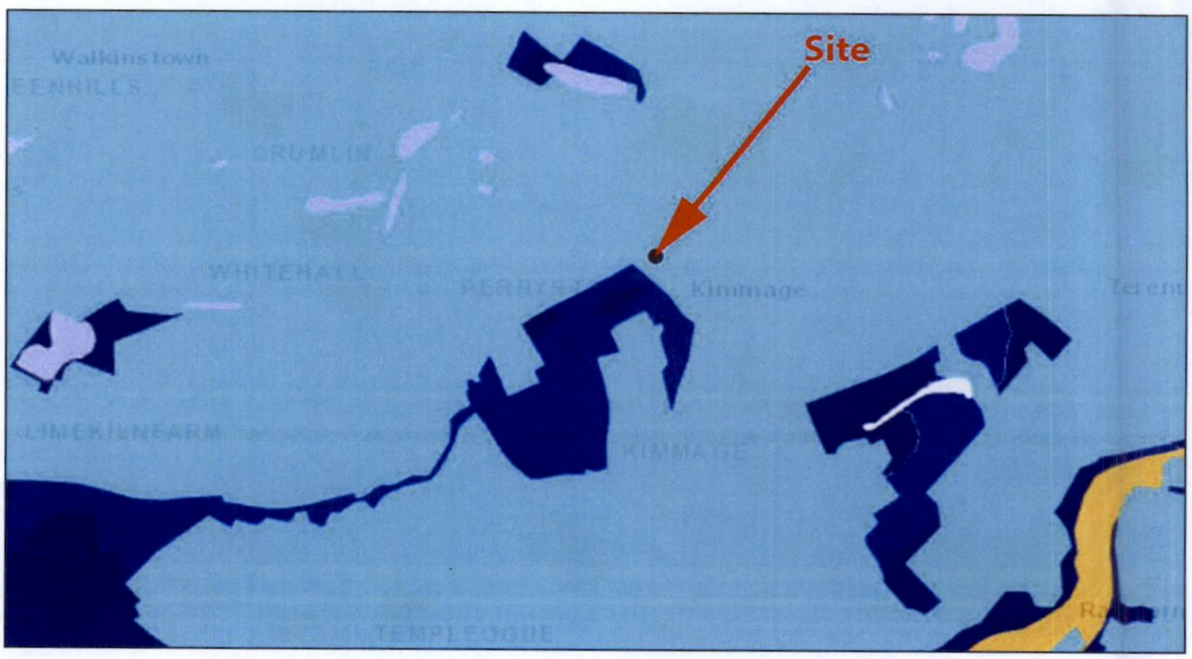


Figure 9 Soil map

Figure 10 Quaternary sediments

2.0 Relevant Guidelines for Planning & Flood Risk Assessment

2.1 Core objectives of the FRM Guidelines for Planning Authorities

The FRM guidelines detail 'mechanisms for the incorporation of flood risk identification, assessment, and management into the planning process'. They detail the integration of flood risk assessment into county development plans along with planned developments. Therefore, the guidelines ensure a systematic and consistent approach.

Notably, the core objectives within the FRA guidelines state:

- 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 floodplains
- Avoid unnecessary restriction of national, regional, or local economic and social growth
- Improve the understanding of flood risk among relevant stakeholders
- Ensure the requirements of EU and national law in relation to the natural environment and nature conservation are complied with for flood risk management.

The key principles set out within The FRM Guidelines are to:

- Avoid the risk, where possible

- Substitute less vulnerable uses, where avoidance is not possible
- Mitigate and manage the risk, where avoidance/substitution is not possible.

2.2 The approach to site flood risk

"*The Planning System and Flood Risk Management Guidelines for Planning Authorities*" (November 2009) classifies residential developments as "*highly vulnerable development*" (Table 3.1 of the Guidelines). Table 3.2 of the Guidelines indicates that such development does not require a justification test for Zone C, see Figure 11 below.

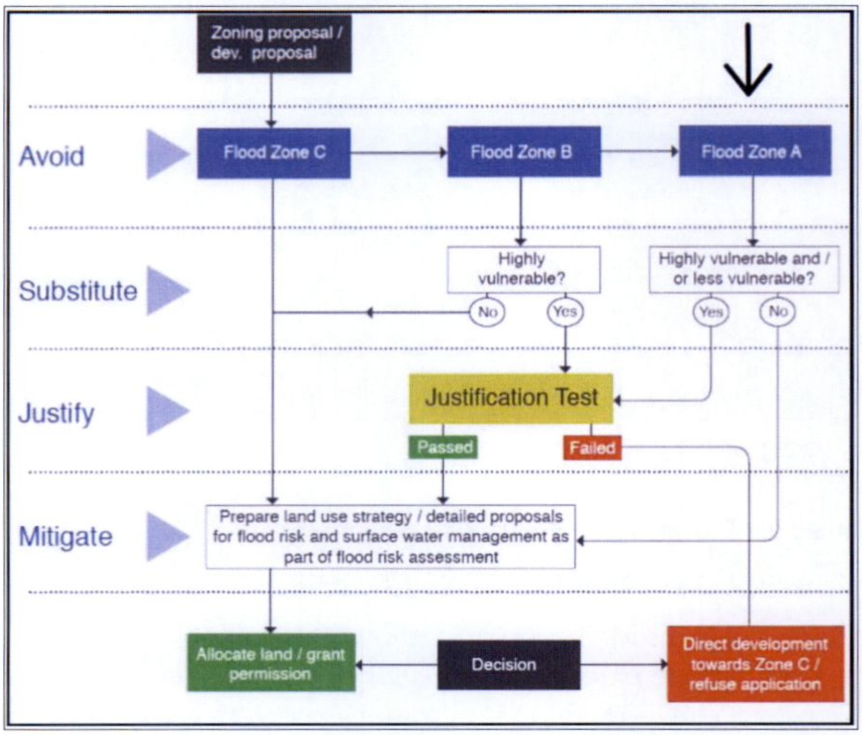


Figure 11 Approach to flood risk in the planning process

2.3 Stages of Flood Risk Assessment

The Flood Risk Management Guidelines recommend a staged approach to flood risk assessment that covers both the likelihood of flooding and the potential consequences. The stages of appraisal and assessment are:

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 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.

2.4 Defining Flood Risk

Flood risk is a combination of the likelihood of a flood event occurring and the potential consequences arising from that flood event and is then normally expressed in terms of the following relationship:

Flood risk = Likelihood of flooding x Consequences of flooding.

To fully assess flood risk an understanding of where the water comes from (i.e., the source), how and where it flows (i.e., the pathways) and the people and assets affected by it (i.e. the receptors) is required. Figure 12 shows the source pathway-receptor model reproduced from the FRM guidelines.

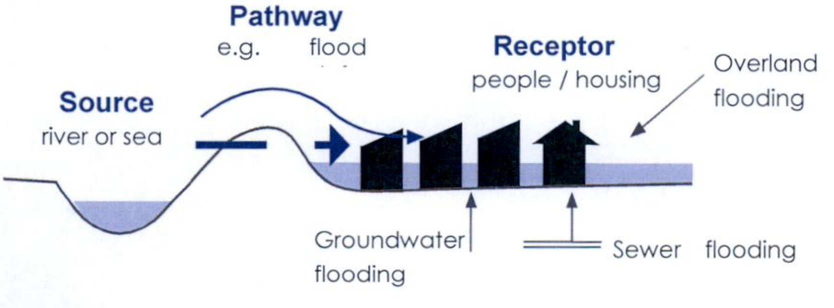


Figure 12 Source-Pathway-Receptor Model

The principal sources of flooding are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains. The receptors can include people, their property, and the environment. All three elements as well as the vulnerability and exposure of receptors must be examined to determine the potential consequences.

2.5 Sources of Flooding

The general sources of flooding which are to be considered for the study are:

2.5.1 Fluvial - Rivers, Streams, Drainage ditches

Fluvial flooding occurs when rivers and streams break their banks and water flows out onto the adjacent low-lying areas (the natural floodplains). This can arise where the runoff from heavy rain exceeds the natural capacity of the river channel and can be exacerbated where a channel is blocked or constrained or, in estuarine areas, where high tide levels impede the flow of the river out into the sea. Different rivers will respond differently to rainfall events, depending on a range of factors such as the size and slope of the catchment, the permeability of the soil and underlying rock, the degree of urbanisation of the catchment and the degree to which flood waters can be stored and slowly released into lakes and along the river's floodplains. A storm of a given rainfall depth and duration may cause flooding in one river, but not in another, and some catchments may be more prone than others to prolonged rainfall or a series of rain events. River flooding can occur rapidly in short, steep rivers or after some time, and some distance from where the rain fell, in larger or more gently flowing rivers. Changes in rainfall patterns, such as might be caused by climate change, will have different impacts on flood magnitudes and frequency in different catchments.

There have been several fluvial flood events in recent years in Ireland; most notably in November 2009 and December 2015/January 2016.

2.5.2 Coastal -Harbours/Quays/Coastline areas/Estuaries

Coastal flooding occurs when sea levels along the coast or in estuaries exceed neighbouring land levels, or overcome coastal defences where these exist, or when waves overtop over the coast. Wind speed and direction and low-pressure systems can force water into estuaries and harbours, cause surge effects, and create extreme wave conditions, such as those seen in the storm events in the Winter of 2013/2014.

2.5.3 Groundwater -Turloughs/Lakes/Springs/Karst Features/Water Table

Groundwater flooding occurs when the level of water stored in the ground rises because of prolonged rainfall, to meet the ground surface and flows out over it, i.e., when the capacity of this underground reservoir is exceeded. Groundwater flooding tends to be very local and results from the interaction of site-specific factors such as local geology and tidal variations. While water level may rise slowly, groundwater flooding can last for extended periods of time. Hence, such flooding may often result in significant damage to property and disruption. In Ireland, groundwater flooding is most related to turloughs in the karstic limestone areas prevalent in the west of

Ireland. Extensive groundwater flooding occurred around South Galway and areas of Mayo, Roscommon, and neighbouring counties in 1995, November 2009 and December 2015/January 2016 due to extended periods of heavy rain.

2.5.4 Pluvial - Ponding of overland flow from intense rainfall

Pluvial flooding occurs when the amount of rainfall exceeds the capacity of urban storm water drainage systems or the ground to absorb it. This excess water flows overland, ponding in natural or man-made hollows and low-lying areas or behind obstructions. This occurs as a rapid response to intense rainfall before the flood waters eventually enter a piped or natural drainage system. This type of flooding is driven by short, intense rainstorms, such as that which occurred over the Dublin area in October 2011.

2.5.5 Infrastructure – e.g., Stormwater Drainage

The above causes of flooding are all natural; caused by either extreme sea levels or heavy or intense rainfall. Floods can also be caused by the failure or exceedance of capacity of built or man-made infrastructure, such as bridge collapses, from blocked or under-sized drainage systems or other piped networks, or the failure or overtopping of reservoirs or other water-retaining embankments (such as raised canals).

2.6 Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and are split into three categories in the Guidelines:

Flood Zone A- Flood Zone A is where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);

Flood Zone B- Flood Zone B is where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 and 0.5% or 1 in 200 for coastal flooding);

Flood Zone C- Flood Zone C is where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding. Flood Zone C covers all plan areas which are not in zones A or B.

It is important to note that when determining flood zones, the presence of flood protection structures should be ignored. This is because areas protected by flood defences still carry a residual risk from overtopping or breach of defences and the fact that there is no guarantee that the defences will be maintained in perpetuity.

2.7 FRM guidelines -Sequential Approach & Justification Test

The FRM Guidelines outline the sequential approach that is to be applied to all levels of the planning process. This approach should also be used in the design and layout of a development, see Figure 13 below. In general, development in areas with a high risk of flooding should be avoided as per the sequential approach. However, this is not always possible as many town and city centres are within flood zones and are targeted for development.

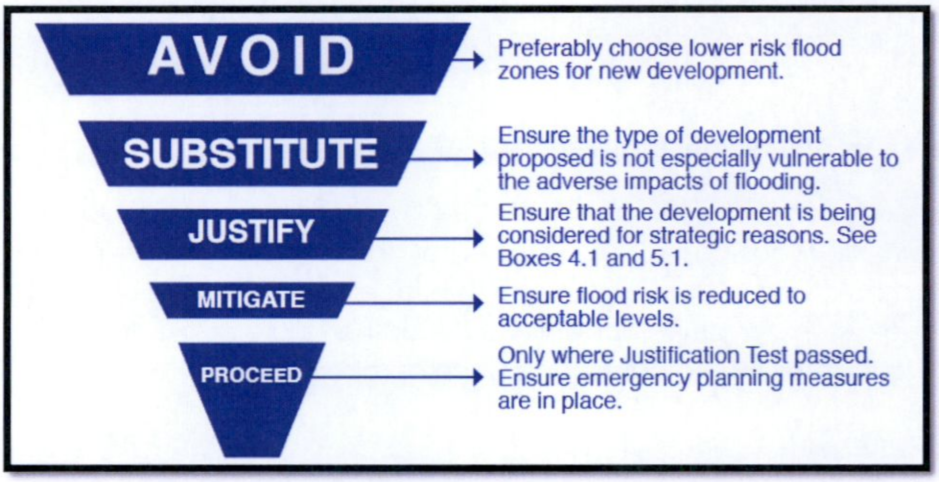


Figure 13 Sequential Approach

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. The test comprises two processes. First is the Plan-making Justification Test and is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding. Second is the Development Management Justification Test and is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land. Developments are classified according to vulnerability, shown in Table 1.

Table 1 Classification of Development Vulnerability

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

*Uses not listed here should be considered on their own merits

Table 2 below shows the Matrix of Vulnerability versus Flood Zone to illustrate appropriate development and that required to meet the justification test.

Table 2 Matrix of Vulnerability versus Flood Zone

Land Uses	Flood Zone A	Flood Zone B	Flood Zone C
HVD – Highly Vulnerable Development	Inappropriate (if proposed then Justification Test & detailed FRA required)	Inappropriate (if proposed then Justification Test & detailed FRA required)	Appropriate (screen for flood risk)
LVD – Less Vulnerable Development	Inappropriate (if proposed then Justification Test & detailed FRA required)	Inappropriate due to climate change (if proposed then Justification Test & detailed FRA required)	Appropriate (screen for flood risk)
WCD – Water-Compatible Development	Appropriate (detailed FRA may be required)	Appropriate (detailed FRA may be required)	Appropriate (screen for flood risk)

2.8 Climate Change

Ireland's climate is changing and understanding and planning require an assessment of the potential consequences of future climate change. Climate change should be considered when assessing flood risk, particularly residual flood risk. Areas of residual risk are extremely vulnerable to climate change impacts, as rising flood levels increase the likelihood of flood defence failure. Because of the level of uncertainty involved in the potential effects, the Planning Guidelines recommend taking a precautionary approach to climate change. The OPW draft guidance provides specific advice on the expected impacts of climate change and the allowances to be made for future flood risk management in Ireland.

According to OPW guidelines, the climate change allowance should always be applied to the 1% AEP fluvial or 0.5% AEP tidal levels. Where a development is sensitive 'critical infrastructure', the impact of climate change on 0.1% AEP flows should be also be considered.

2.9 Key outputs required for Site-Specific Flood Risk Assessment

A site-specific flood risk assessment should generally include:

- Plans showing the site and development proposal and its relationship with watercourses and structures which may influence local hydraulics
- Surveys of site levels and cross-sections relating relevant development levels to sources of flooding and likely flood water levels
- Potential sources of flooding, Flood alleviation measures, potential impact of flooding on the site; reduce risk (layout and form), surface water management proposals, mitigation, residual risk, and management of risk

2.10 Vulnerability of proposed development

This residential development is categorised as highly vulnerable, and the justification test will not apply for such dwellings located in flood zone C as per the South Dublin County Council SFRA 2022-2028.

3.0 Flood Risk Identification – STAGE 1

The Stage 1 flood risk assessment involves appraisal of existing literature to determine risk of flooding from all sources which may require further stage 2 investigation.

3.1 Supporting Literature & Data

Several sources were consulted in identify potential flood risks both on the site and surrounding areas. Table 3 below gives an overview and appraisal of the information sources utilized.

Table 3 Overview of consulted information

	Source	Area of Coverage	Quality of information	Utility	Identified Risk	Risk to site Y/N
Primary Sources (including modelled data)	National Indicative (OPW)	Regional	High	High	N/A	N/A
	OPW CFRAM	Regional	High	N/A	Yes	Yes
	Local Area Plan	Local	High	High	N/A	N/A
	SFRA	Local	High	High	Yes	Yes
	Flood Relief Scheme	Local	High	High	Yes	Yes
Secondary Sources	OPW Historic Records	National	Variable	Moderate	Yes	Yes
	Newspaper/emergency records	Local	High	High	Yes	Yes
	Historic OSI Maps	National	Moderate	Low	No	No
	SAR maps	Regional	Moderate	Moderate	Yes	No
	EPA data	National	Moderate	Moderate	No	No
	Topographic Survey	Local	High	High	Yes	Yes
	Drainage Records	Regional	Moderate	Moderate	No	No
	Geological Maps	National	Moderate	Low	No	No
	Soil Maps	National	Moderate	Moderate	No	No

3.2 Existing Identification of Flood Risk

3.2.1 OPW PFRA

The OPW Preliminary Flood Risk Assessment (PFRA) flood maps were produced across the whole of Ireland and indicate areas that may be prone to flooding. It is important to note at this stage of the FRA that they should not be used as the sole basis for preparing flood zone maps. They are appropriate for a Stage 1 Flood Risk Identification to identify areas requiring further assessment if development is being considered within or adjacent to the flood extents shown. The objective of the PFRA maps were to identify areas where the risks associated with flooding might be significant (Areas for Further Assessment or 'AFAs'). No relevant PFRA map was retrieved for the subject site.

3.2.2 Catchment Flood Risk Assessment and Management (CFRAM)

The OPW CFRAM studies were undertaken to provide more detailed assessment of the AFAs. These give a more accurate assessment of the extent and degree of flood risk, and, where risk is significant, to develop where possible measures to manage and reduce the risk. The CFRAM OPW Flood Risk Assessment Maps are considered the overarching reference for flood risk planning in Ireland. The site lies within the Eastern CFRAM Study Unit of Management (UoM) 9. CFRAM maps for both current and mid-range future scenarios suggest a fluvial flood risk to the site, see Figures 14 and 15.

Figure 14 CFRAM flood map (current)

Figure 15 CFRAM flood map (mid-range future)

3.2.3 Strategic Flood Risk Assessment (SFRA)

The South Dublin County Development Plan SFRA was updated during 2022. A Stage 1 Flood Risk Identification has been undertaken to identify any flooding or surface water management issues related within the County that may warrant further investigation. As part of this stage the most up to date available data at the time of preparation was acquired from the Office of Public Works (OPW) and South Dublin County Council. The Eastern and Dodder CFRAMS has generated flood zone mapping which has been deemed suitable as a Stage 2 Initial Flood Risk Assessment. This flood risk information has enabled SDCC to apply 'The Guidelines' sequential approach, and where necessary the Justification Test, to appraise sites for suitable land zonings and identify how flood risk can be managed as part of the development plan. The latest iteration of the SFRA flood maps shows that the site lies within fluvial Flood Zone A, and outside a pluvial flood zone, see Figures 16 and 17.

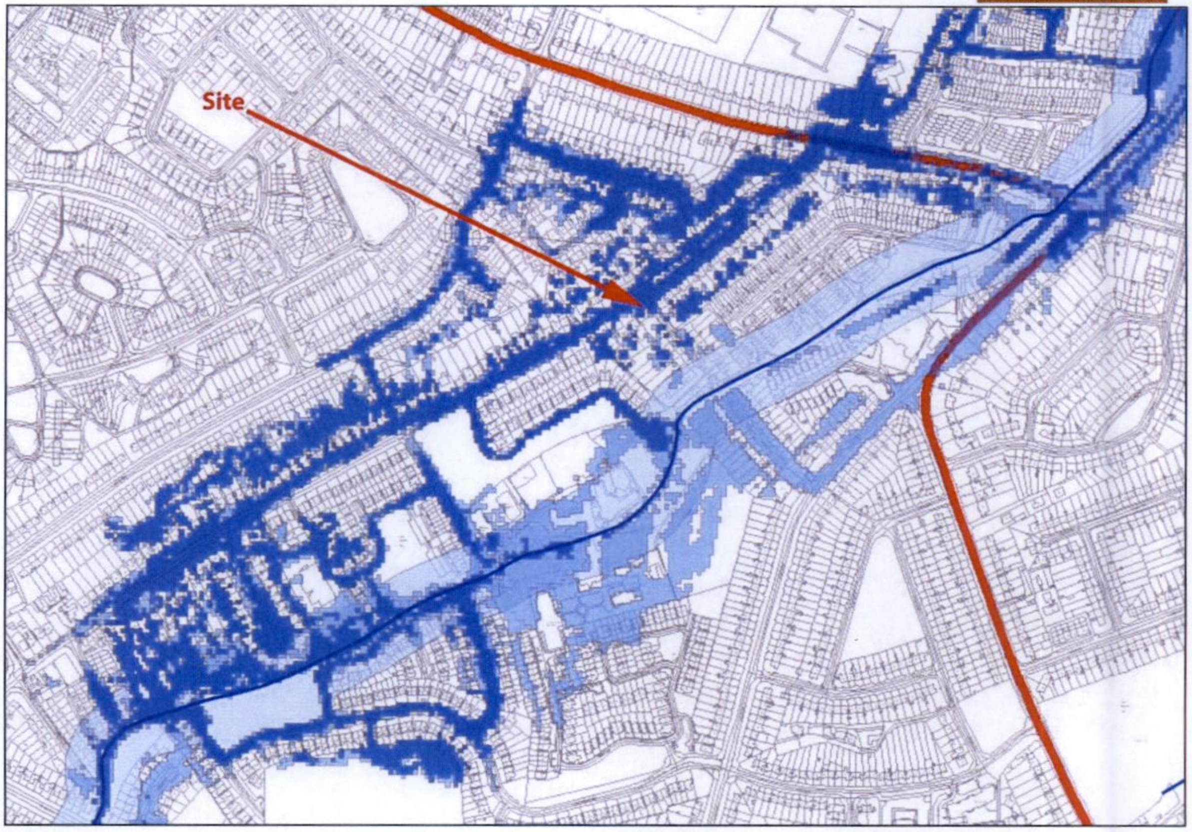


Figure 16 South Dublin CDP SFRA Flood map (fluvial)

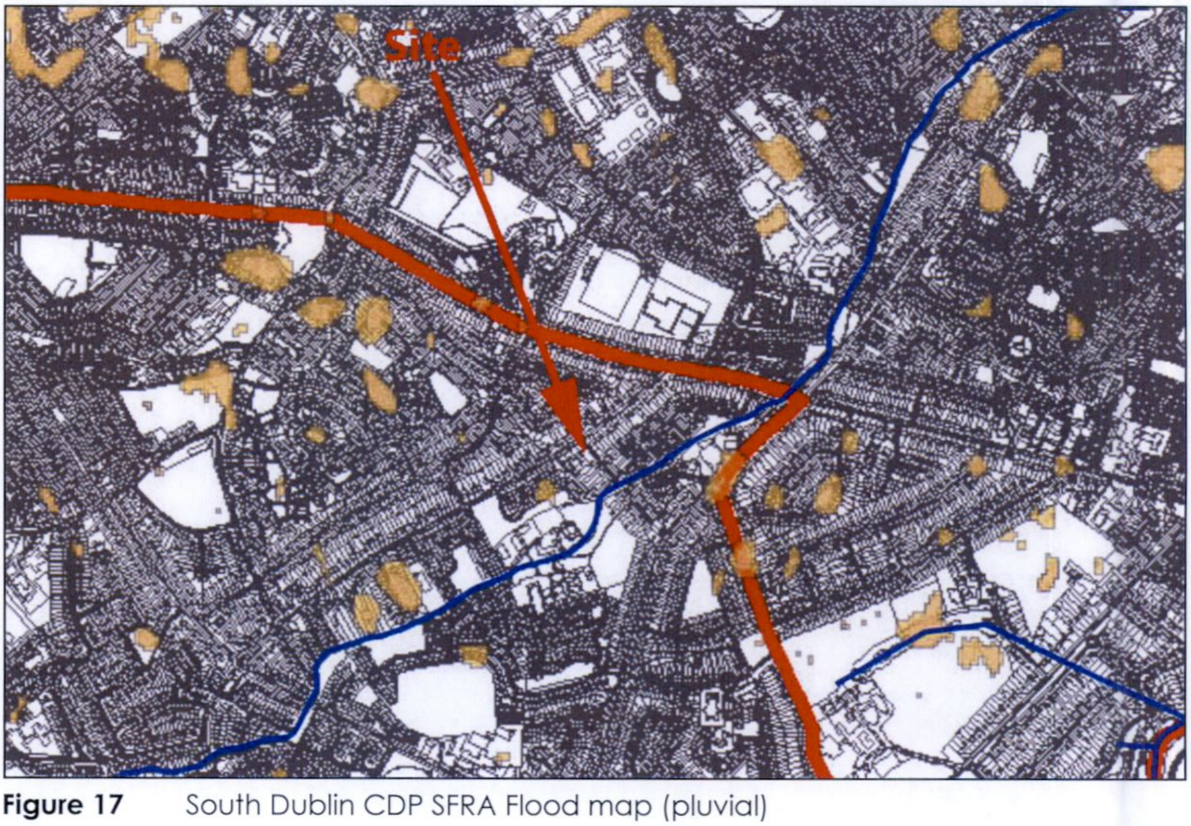


Figure 17 South Dublin CDP SFRA Flood map (pluvial)

3.2.5 *National Indicative Fluvial Mapping (NIFM)*

Smaller catchments outside the scope of the CFRAM study are subject to broad scale modelling under the NIFM. Data has been produced for catchments greater than 5km2 in areas for which flood maps were not produced under the National CFRAM Programme. However, they do not designate individual properties or point locations at risk of flooding, or to replace a detailed site-specific flood risk assessment. NIFM flood maps for both current and mid-range future scenarios do not provide modelled data for this location, see Figure 18.

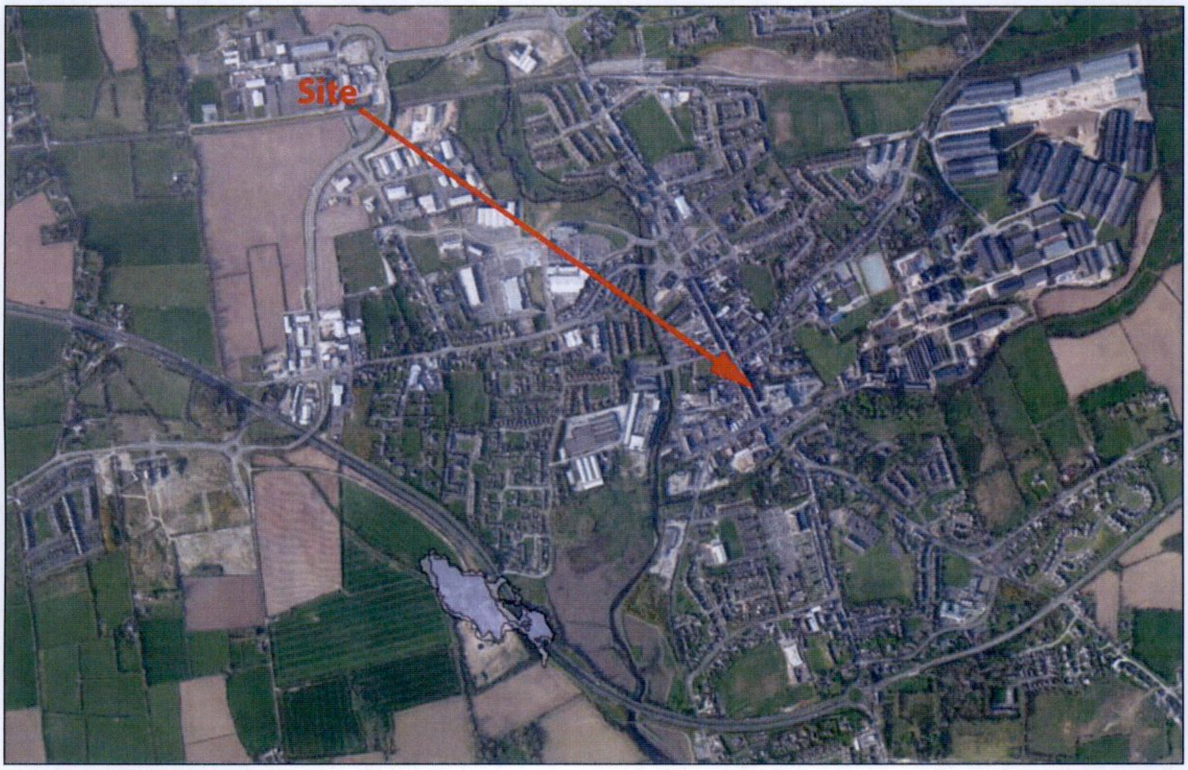


Figure 18 NIFM flood map

3.2.6 *River Poddle Flood Alleviation Scheme*

As a result of the flood history and associated issues, the River Poddle Flood Alleviation Scheme is currently in progress with A planning application having been lodged.

The scheme is designed to alleviate flooding in the River Poddle for a 1% Annual Exceedance Probability (AEP) flood event (also known as the "100-year flood") with 60% blockage in the major culverts and 40% blockage in all other culverts, with an allowance for freeboard in accordance with the OPW guidance. The Scheme combines flood defences along the river channel with main flood storage in Tymon Park and additional flood storage at Whitehall Park and Ravensdale Park. The proposed works are described generally as follows:

• Raised earthen flood embankments along the upper reach of the River in Tymon North (west of the M50) and Tymon Park (east of the M50) to provide flood protection. The embankment at Tymon Lake in Tymon Park will be constructed to provide the main flood storage in the Scheme and a flow control structure at Tymon Lake will control flows downstream in a flood event.

• An integrated constructed wetland (ICW) in Tymon Park to improve water quality. • New, replacement or reinforced flood walls to provide flood protection in residential areas in the middle reach of the River at Whitehall, Kimmage and Perrystown; at Wainsfort Manor Crescent, Terenure; to the rear of properties on Fortfield Road south of Kimmage Crossroads, Kimmage; at the end of St. Martin's Drive in Kimmage; and at Mount Argus Close in Harold's Cross.

• Channel realignment and regrading in Whitehall Park to provide clearance between the river and adjacent properties for flood protection.

• Providing sealed manholes in the vicinity of Poddle Park and Ravensdale Park, Kimmage, and in St. Teresa's Gardens and Donore Avenue, and at the National Stadium in Merchant's Quay, Dublin. An overview of the proposed scheme showing location of works is shown in Figure 19.

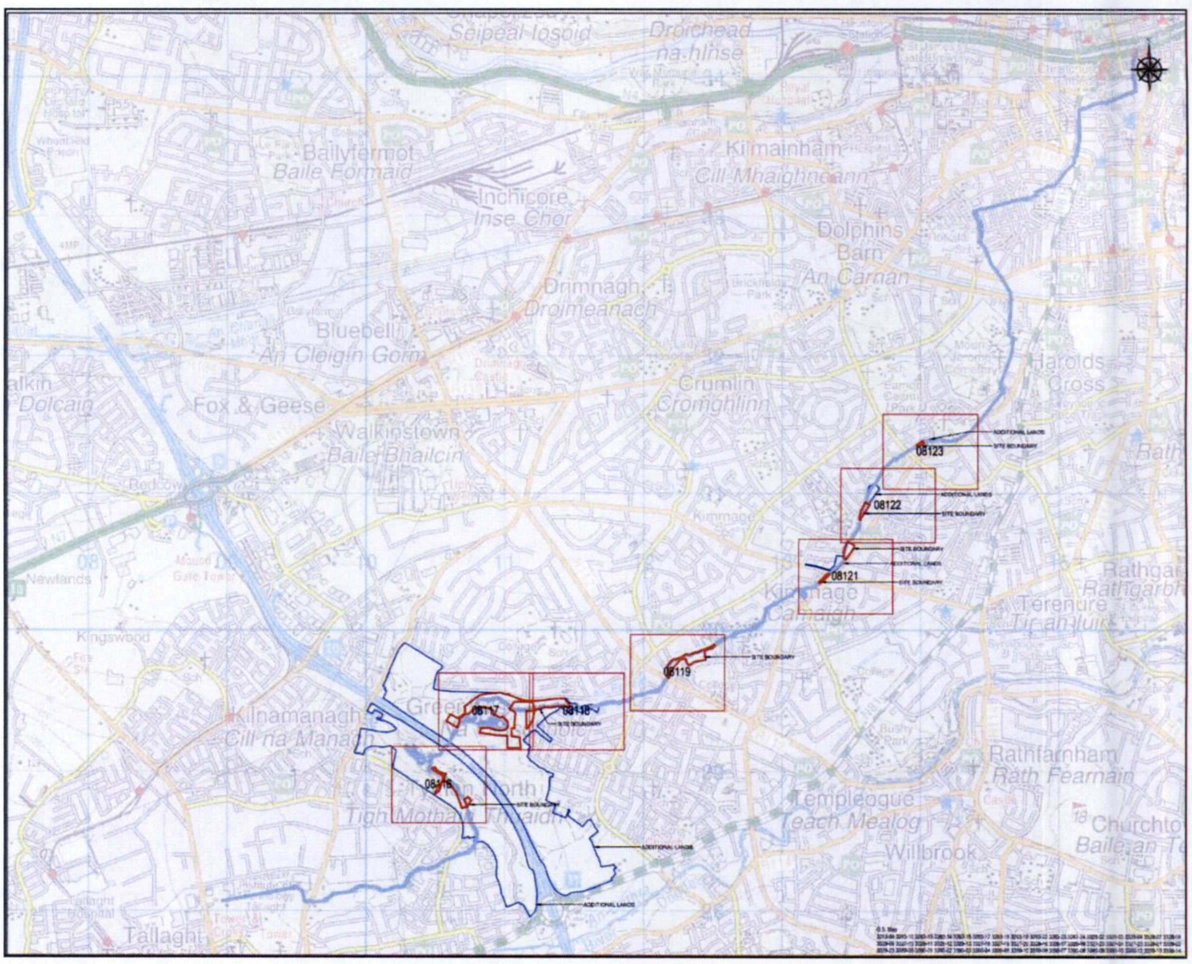


Figure 19 Overview of River Poddle Flood Alleviation Scheme

3.2.7 Topographical Assessment

A hill shade map generated in GIS software shows the site lying below higher ground to the west, see Figure 20. This suggests upstream flooding in the Poddle may find a route towards the site. The site is not significantly elevated from the riverbank immediately to the south.

Figure 20 Hill shade map

3.2.8 Drainage records

Arterial Drainage Schemes (ADS) are schemes the OPW has a statutory duty to maintain. ADS were carried out under the Arterial Drainage Act, 1945 to improve land for agriculture and to mitigate flooding. Rivers, lakes weirs and bridges were modified to enhance conveyance, embankments were built to control the movement of flood water and various other work was carried out under Part II of the Arterial Drainage Act, 1945. The purpose of the schemes was to improve land for agriculture, to ensure that the 3 – year flood was retained in bank this was achieved by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses known as callows. Flood protection in the benefiting lands was increased because of the Arterial Drainage Schemes.

Drainage Districts were carried out by the Commissioners of Public Works under several drainage and navigation acts from 1842 to the 1930s to improve land for agriculture and to mitigate flooding. Channels and lakes were deepened and widened, weirs removed, embankments constructed, bridges replaced or modified, and various other work was carried out. The purpose of the schemes was to improve land for agriculture, by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses known as callows. Drainage Districts cover approximately 10% of the country, typically the flattest areas. Local authorities are charged with responsibility to maintain Drainage Districts. The Arterial Drainage Act, 1945 contains several provisions for the management of Drainage Districts in Part III and Part VIII of the act. The site lies does not lie within ADS or DD scheme.

3.2.9 Flood History

<u>*Flood Relief Scheme information*</u>

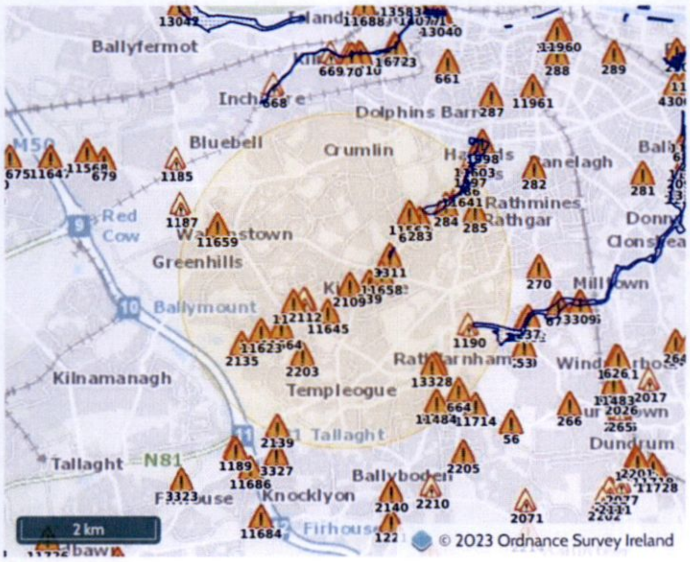
"There is a long history of flooding from the River Poddle due in no small part to the many historic man-made alterations to the watercourse. Throughout the course of the growth of Dublin City and the development of the Poddle catchment, the conveyance capacity of the river became increasingly constrained and natural areas of floodplain ultimately gradually reduced with increased urbanisation over the years. Due to the constrained nature of the river as it exists today, the Poddle is particularly susceptible to blockages from accumulating debris and fly-tipping at the various structures along its course. In recent times the most significant recorded instances have occurred in 1986, 1993, 2000, 2008 and most recently in 2011. Very significant flooding occurred in October 2011 when up to 90mm of rain was reported to have fallen within a six hour period on the evening of the 24th. The Crumlin and Harold's Cross areas were affected particularly severely during the 2011 event, although flooding was widespread along the Poddle's course."

<u>*OPW*</u>

OPW records at floodmaps.ie shows several flood events in the area, see Figure 21 showing a flood summary within 2.5km. Two notable flood events occurred on 10th June 1993 (ID-2109-Poddle River Whitehall Gardens), adjacent to the site, and October 2011 (ID-11645), upstream of the site. Flood waters in 2011 reached 0.5 metres. A perusal of records for the 1993 flood event, showed flood waters reached several neighbouring properties, including no. 33 and 39 Whitehall Road who utilised sandbags during these events.

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.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

30 Results

Name (Flood_ID)	Start Date	Event Location
1. Poddle August 1986 (ID-32)	24/08/1986	Area
Additional Information: Reports (9) Press Archive (1)		
2. Poddle River Whitehall Gardens June 1993 (ID-2109)	10/06/1993	Exact Point
Additional Information: Reports (1) Press Archive (1)		
3. Poddle River Whitehall Road June 1993 (ID-2112)	10/06/1993	Approximate Point
Additional Information: Reports (1) Press Archive (0)		
4. Old City water Course Spawell House Feb 1994 (ID-2139)	03/02/1994	Exact Point
Additional Information: Reports (1) Press Archive (0)		
5. Poddle Glendown Crescent Feb 1994 (ID-2203)	03/02/1994	Exact Point
Additional Information: Reports (1) Press Archive (0)		
6. Poddle Park Nov 2000 (ID-3311)	05/11/2000	Approximate Point
Additional Information: Reports (1) Press Archive (0)		

Figure 21 OPW historical flooding map summary

Plate 1 Flooding at the River Poddle during 2011

Plate 2 Flooding at the River Poddle during 2011

3 DIE IN FLOOD

Car plunges into raging river depths

By HELEN QUINN

Three people — one of them a young boy — are feared dead in the "monsoon-type" rains which deluged the country overnight.

Tragedy struck in Duleek, Co Meath, as two motorists were lost when their car plunged into a river and, in Baldoyle, Co Dublin, when a youngster was swept into a hole in the ground.

Fourteen-year-old Eric Alan Lamb, from Meadowbrook, was walking along a wall, negotiating flooding around a trench behind the Brookstone cottages, when he fell into the waters, say witnesses.

A passer-by tried frantically to rescue the boy, reaching him as he was sucked into the depths, but could not manage to hold on.

Brian Cunningham, from Donaghmede, was with his daughter, Aoife, when he spotted the drowning boy in the water at the junction of the Willie Nolan/Grange Road area. He waded into the ditch, reached out to Alan, but could not hang on to him. The exhausted man was

hole in the ground.

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Brian Cunningham, from Donaghmede, was with his daughter, Aoife, when he spotted the drowning boy in the water at the junction of the Willie Nolan/Grange Road area. He waded into the ditch, reached out to Alan, but could not hang on to him. The exhausted man was
himself later taken to hospital.

Furious locals today claimed that they have been asking for this ditch to be filled in for years. "Isn't it ridiculous that a tragedy has to happen before something can be done. This area is consistently being flooded," said local Anne Brown.

Meanwhile, as the torrential rain and flooding forced many motorists from their cars, householders from their homes and caused millions of pounds of damage, two other young men are missing, presumed dead, after plunging their car into a seething river.

One other man, a teenager, was rescued from the river Nanny in Duleek, Co Meath, after bystanders saw the car hit a barrell and career off the main road into the river and disappear.

The rescued man, David McKeown, 19, from The Baily, in Ashbourne, was released from hospital after treatment.

He told rescuers he had taken a lift in the car, travelling from Drogheda, in which there was one teenager, and another man in his early 20s, both from the Ashbourne area.

Treacherous conditions

Treacherous conditions

Downpour wreaks havoc

Carol Flynn
Staff reporter

Homes and cars were destroyed last night as the torrential rain wreaked havoc across Leinster, Ulster and the midlands.

There were thousands of calls for help as motorists and families were stranded in the nightmare conditions. Many were still being evacuated from their flooded homes today.

Hundreds of cars were abandoned across the county — and some owners got a second shock today when they found their cars had been vandalised during the night.

While levels were subsiding today and most main roads became passable, gardai still warned motorists to exercise extreme caution.

Trains were prevented from leaving Heuston station — and today delays of an hour were still reported on mainline routes to the south and southwest.

This was due to flooding in Hazelhatch; Iarnrod Eireann ran a bus service between Dublin and Kildare.

The Liffey, the Dodder, the Camac and the Poddle all burst their banks, stretching the emergency services to their limits.

Four inches of rain fell mainly in the Dublin area yesterday, but according to the Met this is not a record.

Even so, it was worse than Hurricane Charlie in 1986, which brought three inches of rain. And in Mount Merrion in 1963 four inches of rain fell in one hour.

More than 70 cars were abandoned on the airport road alone, with hundreds of others scattered across the county.

Plate 3 Newspaper report of 1993 flood

GSI

No relevant records were retrieved from the Maximum Historic Groundwater Flood Maps.

Synthetic Aperture Radar (SAR) data

The Seasonal Flood Maps from Synthetic Aperture Radar (SAR) show observed peak flood extents from Autumn 2015 to Summer 2021. The maps were created using images from the Copernicus Programme Sentinel-1 satellites' Synthetic Aperture Radar (SAR). SAR systems transmit radar pulses to satellites, which record the return signal. Water and other flat surfaces produce a low signal. SAR imagery can be classified into non-flooded and flooded pixels based on this low signal. They are based solely on remote sensing information and does not distinguish between groundwater and surface water floods. The combined 2015-2021 SAR flood map shows exceedance events to the west, but these are not relevant to the site, see Figure 22.

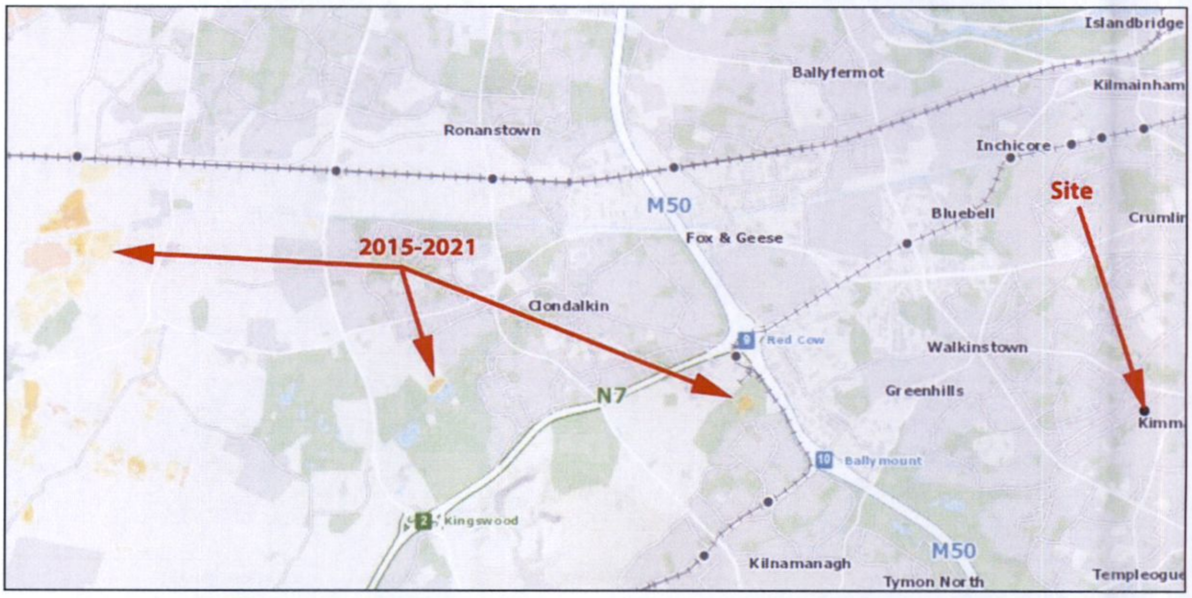


Figure 22 SAR flood map (2015-2021)

3.3 Source Pathway-Receptor Model

In accordance with the FRM guidelines, the sources of flooding for the site and its surroundings have been identified and tabulated into a Source-Receptor-Pathway analysis table, show below in Table 4.

Table 4 Source-Receptor-Pathway Analysis Table

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Tidal	-	-	-	-	-
Fluvial	Surcharged River Poddle	Subject Site	Possible	Damage to infrastructure, risk to occupants	Moderate
Pluvial	Ponding or Overland flows leasing to flooding to site	Subject Site	Remote	-	Low
Groundwater	Rising Groundwater levels	Subject Site	Remote	-	Remote
Infrastructure	Drain blockage/ Sewer flooding	Subject Site	Remote	-	Low

3.4 Conclusion (Identified sources warranting STAGE 2 Assessment)

The relevant flood mechanism for the site is fluvial flooding from the River Poddle. The site elevation does not provide significant protection from surcharged flows in the watercourse. CFRAM and SFRA flood maps place the site within a flood zone. Historical records showed several flood events at the River Poddle, and suggested neighbouring properties were affected. The River Poddle Flood Alleviation Scheme is currently in progress which will alleviate flood risk at the site the 1%AEP level (to include culvert blockage and freeboard). Pending completion of the scheme, a Stage 2 flood risk assessment is needed to appraise the evidence and determine predicted flood depths at the development using published modelling data. This will also include potential mitigation that can be taken as an interim step prior to completion of the flood alleviation scheme.

4.0 Initial Flood Risk Assessment – STAGE 2

The STAGE 1 Flood Risk Assessment concluded that the risk to the site from fluvial flooding is high. The River Poddle Flood Alleviation Scheme is currently not completed, therefore there is an extant flood risk to the site. This Stage 2 FRA (initial flood risk assessment) aims to:

- Confirm the sources of flooding that may affect the site.
- Determine flood extent and depths at the site from modelled data.
- Recommend suitable mitigation.
- Recommend suitable SuDS measures for this development.

4.1 Initial assessment

4.1.1 CFRAM

Hydraulic modelling was undertaken under the Eastern CFRAM Study UoM9. This modelled the Poddle as a High Priority Watercourse under Model HA09_PODD, see model extent in Figure 23. A 2D hillshade map showing the Poddle elevation from source to discharge is shown in Figure 24. The model reach was performed using A 1D/2D flexible mesh ICM model. This utilises appropriate supplementary datasets from the GDSDS to better represent this highly urbanised system. This model is considered well calibrated given that an event of 1-2%AEP was experienced and relatively well documented in October 2011 and supplemented by information on other fluvial events recorded since the 1980s.

To provide a more moderate sensitivity test for flow increase the MRFS extents were also compared with the Design 1% AEP extent. In this case the increase in rainfall in the catchment was 20%, a substantial additional quantity of flooding was predicted. However much of the additional flood extent was confined to the road network, see Figure 25. This suggests high levels of confidence on predicted flood levels at the subject site.

The CFRAM node data shows a direct conduit between 09PODD00580X and the subject site, see Figure 26. Flood levels at this node reach 52.75 (1%AEP scenario) and 52.87mOD (0.1%AEP scenario). The flexible mesh model allows for estimates of flooding having traversed the urban setting towards the site. Therefore, predicted flood depths for both scenarios are in the region of 0-25cm at the site location, suggesting a maximum flood level of ~ 48.0mOD, see Figure 27 showing the 1%AEP scenario.

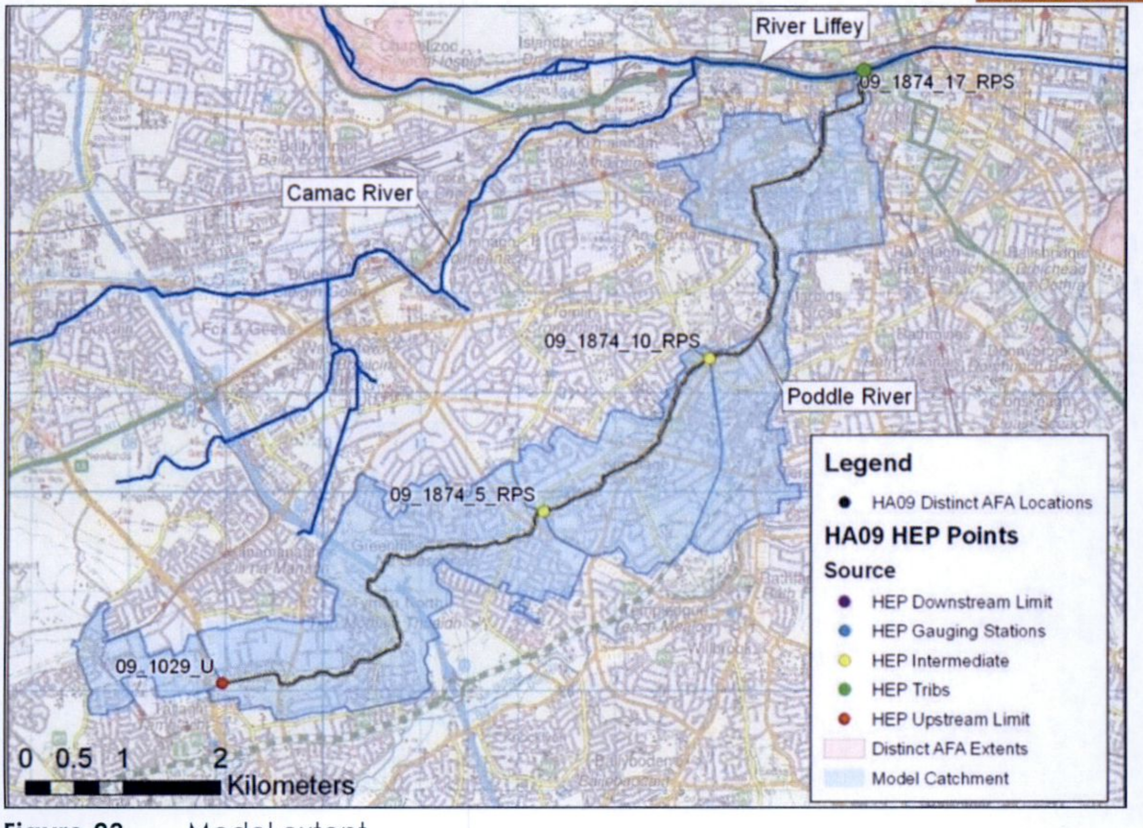


Figure 23 Model extent

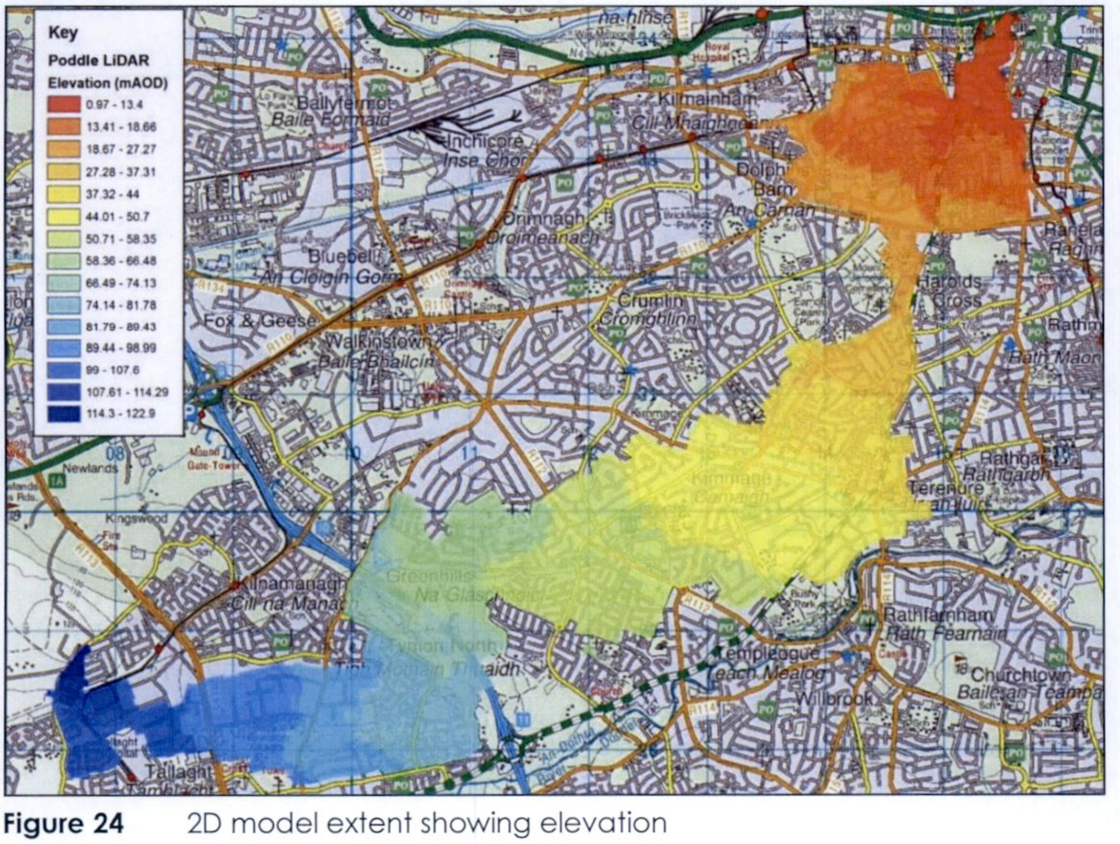


Figure 24 2D model extent showing elevation

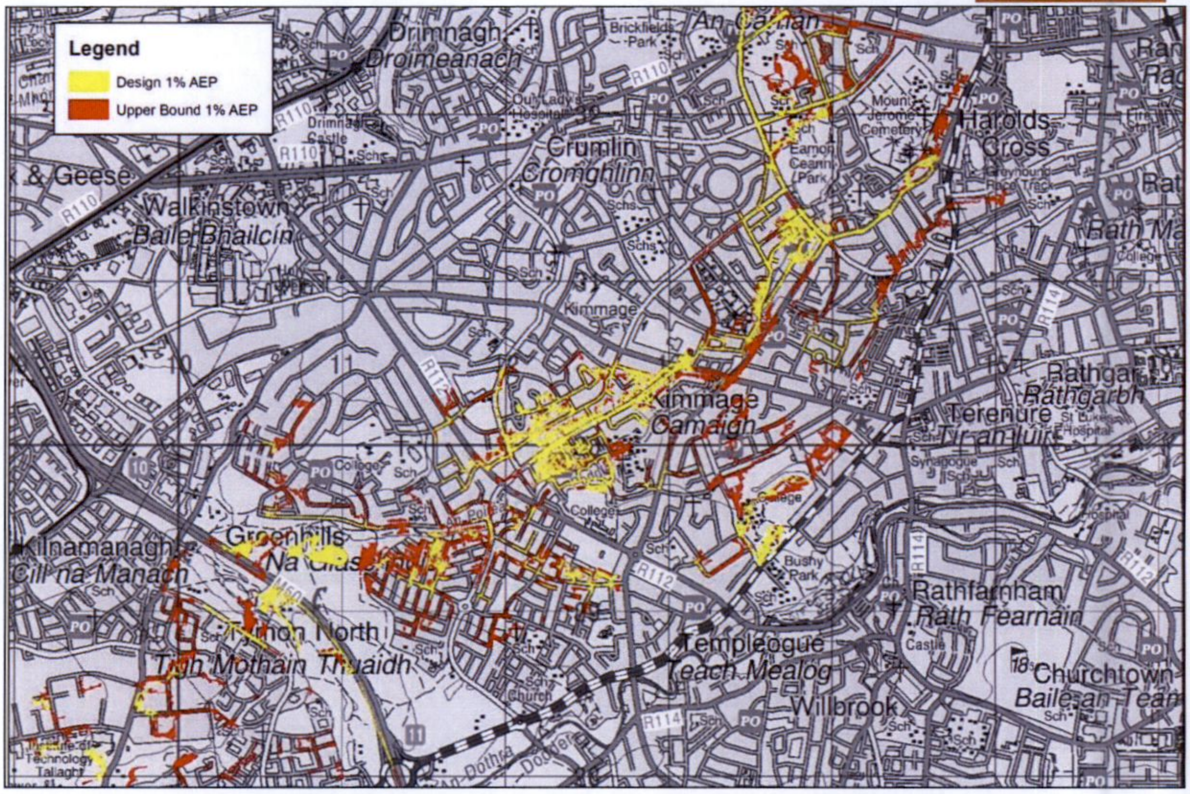


Figure 25 Sensitivity analysis (MFRS +20%)

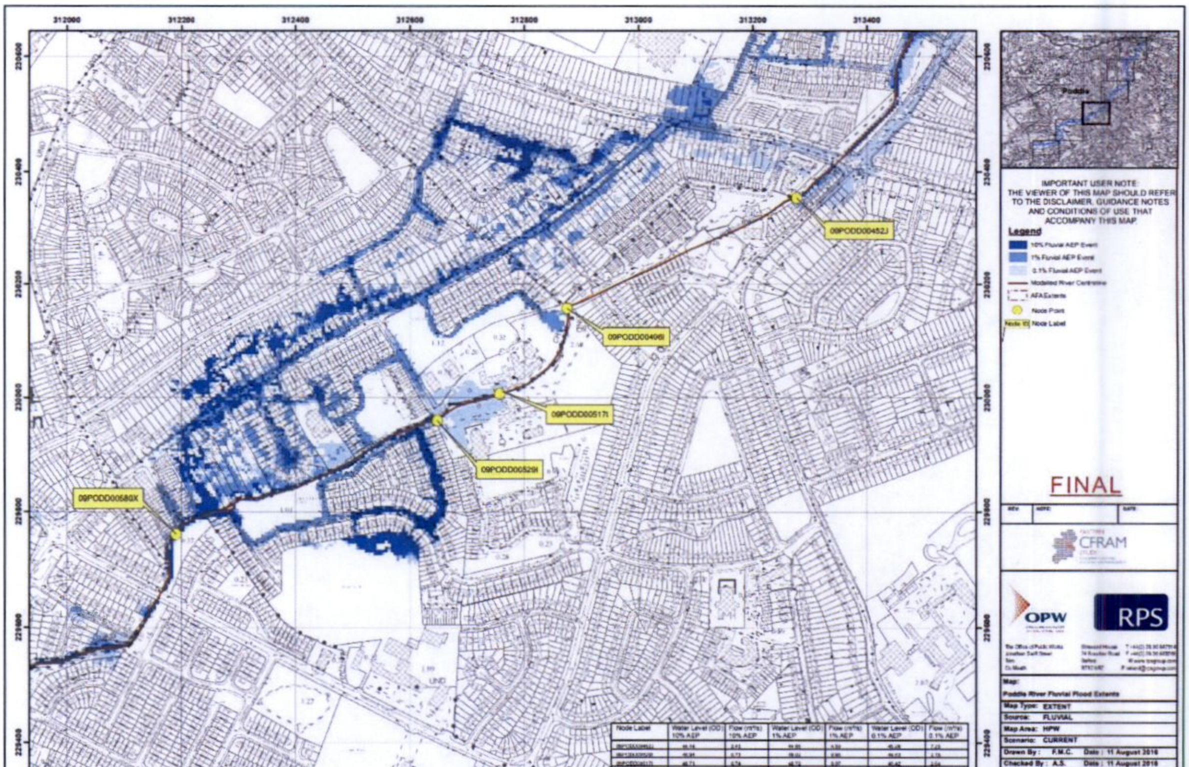


Figure 26 CFRAM node data

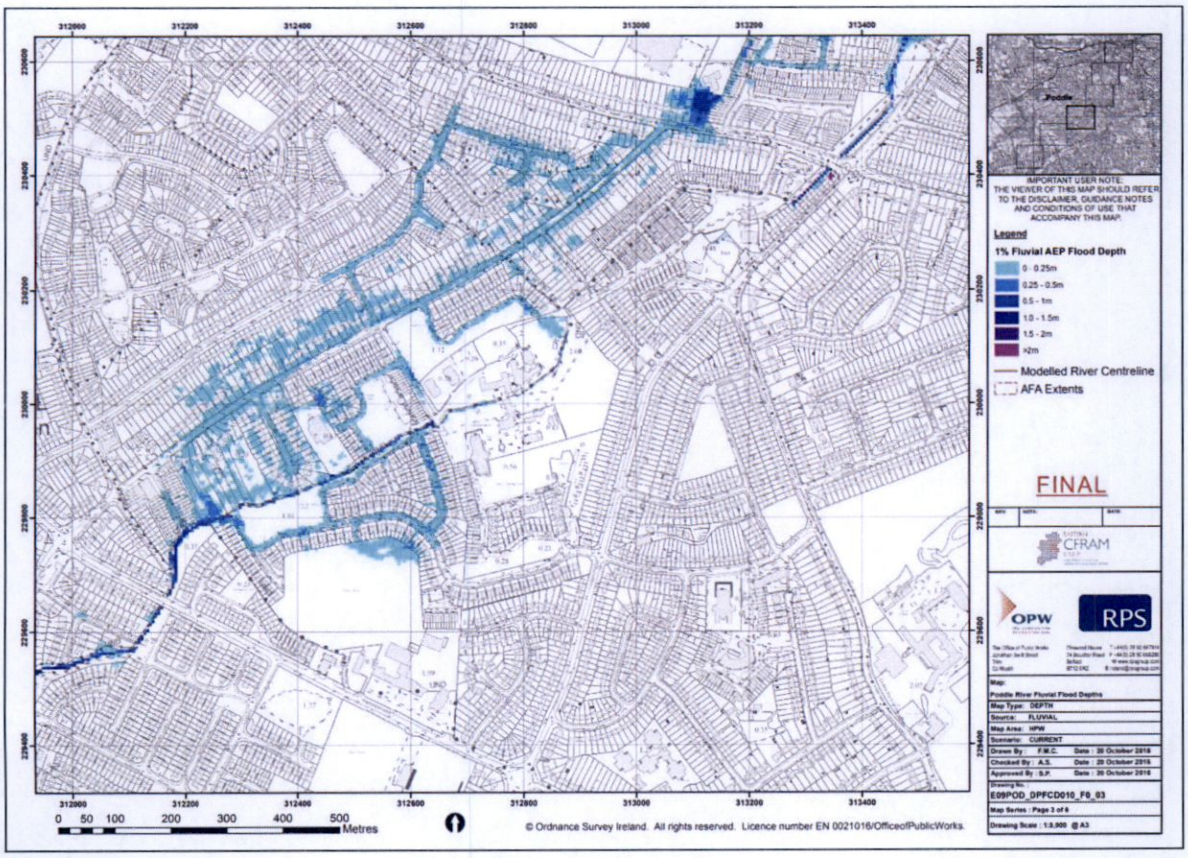


Figure 27 Estimated flood depths (1%AEP)

4.1.2 SFRA and NIFM data

SFRA flood maps are not considered site specific, although they align with CFRAM predictive flood maps. ARC-GIS overlays suggest similar flood depths for the 1%AEP flood event as the CFRAM modelling. The availability of specific quantitative data for the site location provides better utility for this report.

4.1.3 River Poddle Flood Alleviation Scheme

Significant work will be done at the CFRAM study's two nearest nodes to the site. The upstream works at 08119 are most relevant, see Figure 28. This is the point of a conduit between surcharged flows in the channel and the subject site. Completed works at this location will provide protection to the 1%AEP plus allowances for culvert blockage and freeboard. Given the marginal differences between 1/100 and 1/1000 returns, the Flood Alleviation Scheme most likely will prevent floodwaters reaching the site. However, it must be stressed that the scheme is still in progress.

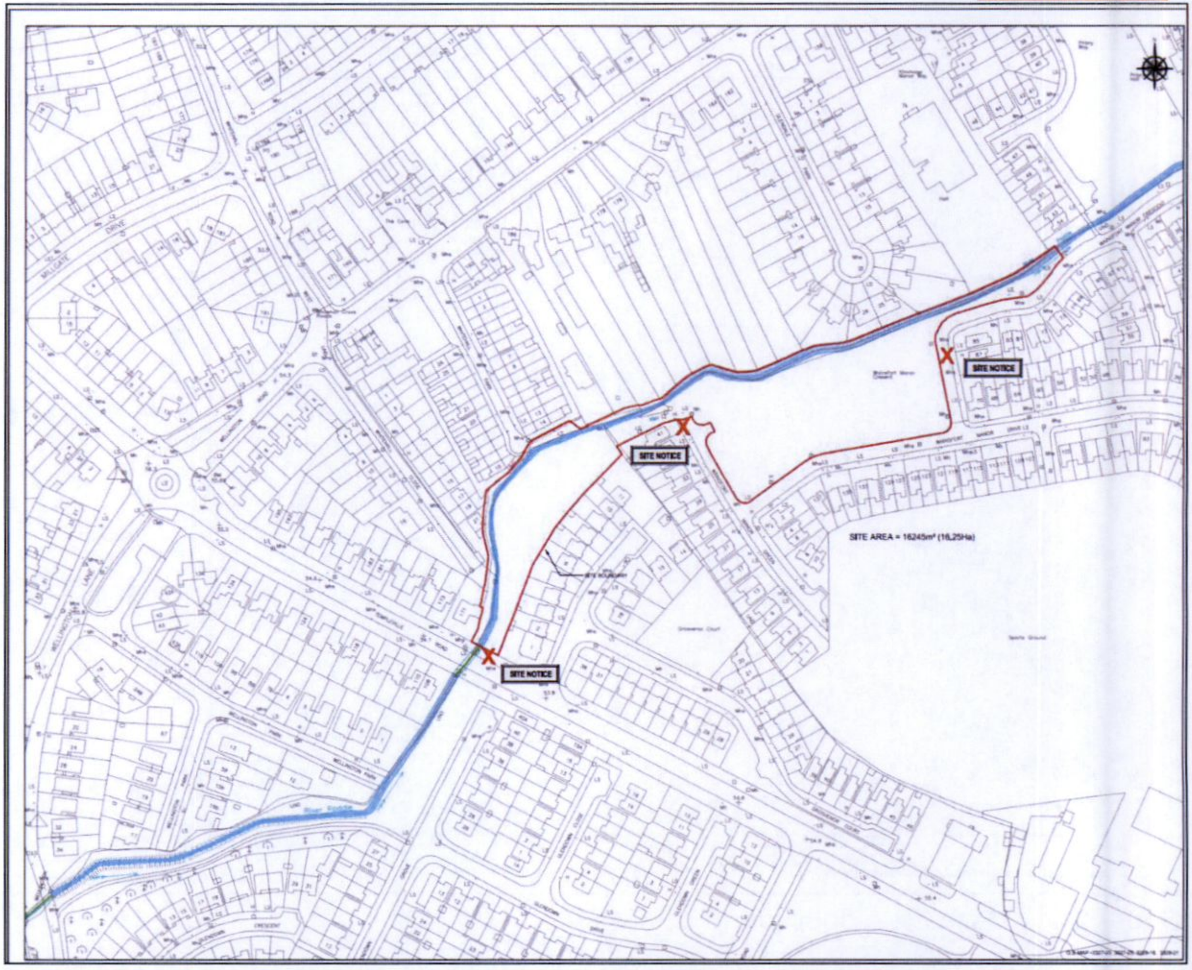


Figure 28 Upstream works that will alleviate potential flooding at the subject site

4.1.4 Topographical inspection

The contour map of the site location (see Figure 29 generated from 25cm Lidar) shows the adjoining street levels between 47.5 and 47.75mOD. The documented flood history and predictive flood maps both suggest that these levels are breached during 1%AEP flood events. Hydraulic modelling under the CFRAM study suggests flood depths of 0-25cm for the 1%AEP event at the site location.

Figure 29 Street levels surrounding site (25cm Lidar)

4.1.5 Groundwater

Flood maps from the OPW and GSI did not suggest any groundwater flood risk to the subject site. Additional factors such as soil permeability and drainage characteristics suggest the risk of groundwater flooding is remote. The site does not lie within a region containing karstic features.

4.1.6 Pluvial

Site contours do not indicate sharp depressions or areas of lower ground surrounding the site conducive to ponding. OPW and SFRA maps do not suggest this as a relevant mechanism.

4.1.7 Foul water

Wastewater from the development will be fed to the public sewer with a new connection. The development scale does not suggest any significant impact on loading or risk of sewer flooding as a relevant mechanism.

4.2 Flood risk to the subject site

Given current estimated flood depths (0-25cm), and pending completion of the Poddle Flood Alleviation Scheme, the flood risk to the site is deemed low. The site layout is shown in Figure 30.

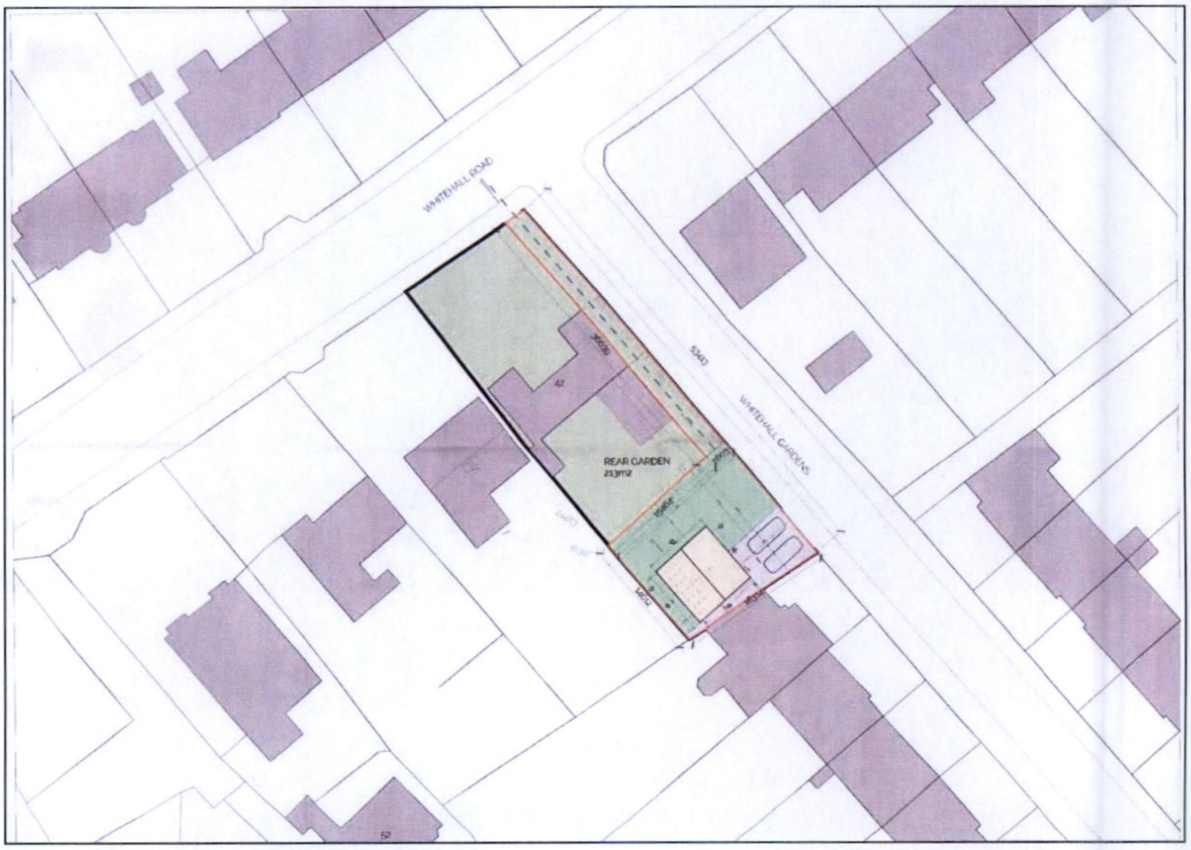


Figure 30 Proposed site layout

4.2.1 Flood risk to the proposed development

The finished flood level of the proposed development is proposed at 47.95mOD, +200mm above road levels (47.75mOD). Although this does not reach the ideal flood defence level of 500mm freeboard based on current modelling; the risk of flood waters inundating the dwelling is low based on predicted flood depths of ~48.0mOD. On balance, development at this site warrants flood resilience and resistance measures as a precautionary measure.

On this basis, the justification test for development applies, and is found in Appendix A.

4.3 Impact on neighbouring development / flooding elsewhere

4.3.1 Removal of flood storage

Assuming the higher flood depth estimates as the worst-case scenario, the proposed dwelling's footprint removes 120m^3. These levels are insignificant in terms of the overall flood envelope, and the distribution of these flood waters would have no significant impact on flood levels elsewhere.

4.3.2 Flowpaths at the site

As the development lies on an existing footprint in an urban location, there are no major flow paths across to the site, see Figure 31 showing flow paths generated in GIS software using Lidar data. Natural flows are minor and are dispersed from the site location along the road. There are no points of flow accumulation to suggest ponding.

Figure 31 Flow paths

4.3.3 Surface water management

Rainfall runoff from the proposed development is to the public surface water sewer. Details of storm water gullies, AJs, and piping is to be provided by the architect.

Estimates for runoff peak discharge and volumes in terms of the 6-hr 100-yr rainfall event may be calculated from the rational equation:

Q = C *i* A

Where:
Q = Peak discharge, m^3/s
c = Rational method runoff coefficient
i = Rainfall intensity, mm/hour
A = Drainage area m^2

Taking a roof footprint of $155m^2$, runoff coefficient of 0.9, and rainfall of 9.01 mm/hr this gives a peak discharge (Q) of $35 \times 10^{-5} m^3/s$, giving a 6 hour-100-year runoff volume of $7.47m^3$.

Given the existing site footprint and drainage, and existing hard surfaces within the site, no additional contribution to runoff is envisaged.

4.4 Sustainable Drainage Systems (SuDS)

New developments should be adequately serviced with surface water drainage infrastructure and incorporate the use of SuDS and water sensitive urban design. Planning applications for new developments will be required to provide details of surface water drainage, and sustainable drainage systems proposals. The integration of nature-based solutions, such as amenity areas, ecological corridors, and attenuation ponds, into public and private development initiatives should be encouraged. Where multiple individual proposals are being made, in larger settlements, for example, area based Sustainable Drainage Systems should be integrated where appropriate and relevant. The applicability of different water sensitive urban design/SuDS techniques is dependent on the site in question combined with the proposed development, the nature and design of which at Plan level is not known. Proposals for development should consider Greater Dublin Strategic Drainage Study documents in designing SUDS solutions, including the New Development Policy, the Final Strategy Report, the Code of Practice and "Irish SuDS: guidance on applying the GDSDS surface water drainage criteria".

SuDS employ a series of techniques that are classified as a management train. This attenuates flow velocity of surface water through the system, and/or pollutants are eliminated. The following steps may be included: Source control technologies that reduce water volumes that enter the drainage/river network by intercepting run-off water on rooftops for re-use (e.g., irrigation) or storage and subsequent evapotranspiration (e.g., green roofs). Pre-treatment steps, such as vegetated swales or filter trenches, that remove pollutants from surface water prior to discharge to watercourses or aquifers retention systems that delay surface water discharge to watercourses by providing storage within ponds, retention basins, or wetlands, such as infiltration systems, such as infiltration trenches and soakaways, that mimic natural recharge. The SuDS management train is shown in Figure 32 (source: Anglian Water UK)

Figure 32 SuDS management train (source: Anglian Water UK, 2023)

The main SuDS components may be classified as:

- Filter strips and swales
- Filter drains and permeable surfaces
- Green roofs and bio-retention areas
- Infiltration structures
- Basins, ponds and wetlands
- Underground storage
- Inlets, outlets and control structures to manage the flow of water

The recommended SuDS measures for this development are specified using the SuDS selection hierarchy sheet shown in Table 5. Appendix B provides more details about the recommended measures and specification.

Table 5 SuDS selection hierarchy sheet

SUDS SELECTION HIERARCHY SHEET FOR SMALL-SCALE DEVELOPMENT			
SuDS Measures		**Measures to be used on site**	**Rational for selecting/not selecting measure**
Water butt – 150L capacity or more (based water use demand) with means of overflow to soakaway/sewer		N/A	Appropriate for minor development, however not ideal for development scale and garden water usage
Permeable paving – consider for all hard paved areas without heavy traffic		This should be considered for driveway/parking bays at the site	Depending on design, paving material, soil type, and rainfall, permeable paving can infiltrate as much as 70% to 80% of annual rainfall. This will significantly reduce runoff volumes.
Bio-retention planter – disconnect downpipe connection into drains and allow roof runoff into planter with means of overflow to soakaway/sewer		Bio-retention planters should be located at each downpipe with overflow to public sewer	Appropriate for minor development. Good use of runoff. Overflow to public main
Green / Blue Roof – requires a minimum substrate depth (growth medium) of at least 80 mm excluding the vegetative map		N/A	Not suitable for the project
Rain garden - disconnect downpipe/RWP into the planted flower bed		N/A	Not suitable for the project
Attenuation tanks	-	N/A	Not suitable for the project
Other	N/A	N/A	N/A

4.5 Mitigation for development in a flood zone

Given that the Poddle Flood Alleviation Scheme is still in progress, there remains a risk of fluvial flooding at the site. However, the estimated flood depths are relatively low, and steps could be taken as part of a flood resistance and resilience building strategy, as shown in Figure 33.

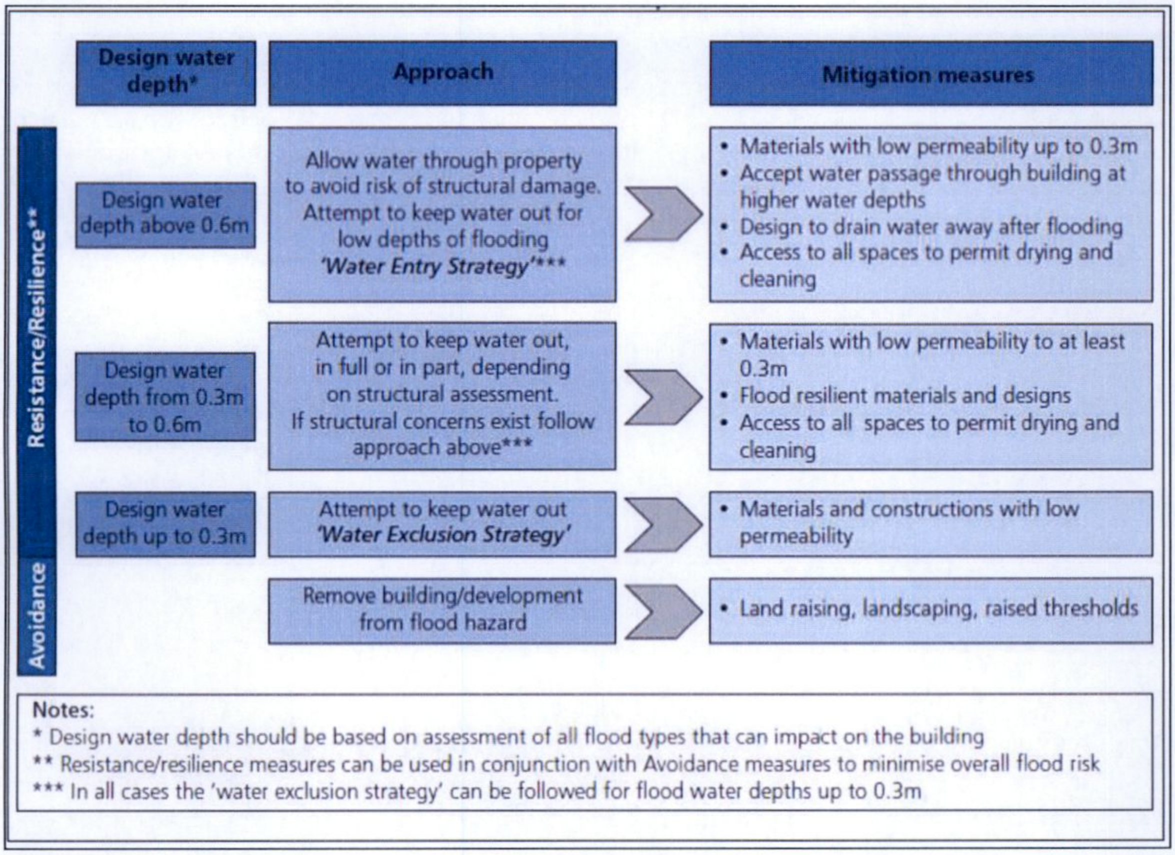


Figure 33 Flood resistance and resilience building approach (CLG, UK)

4.5.1 Flood resistance

Considering the potential flood depth at the site, a flood resistance approach is deemed most suitable. Flood Resistant measures aim at preventing flood waters from entering a building. These incorporate features such as flood doors, flood boards and air brick cover, etc. to minimise water ingress. These usually fall into two categories, structures such as flood boards that must be fitted immediately prior to flooding occurring and passive flood proofing that work without the need of human intervention. Flood resistant measures can only be used where flood depths are relatively shallow (less than 0.6m) as excluding water at greater depth than this can cause structural damage to buildings. Flood resistant measures are best used where flooding is relatively shallow, short duration and, unless the measures are passive, the area is covered by a reliable flood warning system. Table 6 summarises suitable flood resistance measures for this development. These measures should be considered under the guidance of structural engineering professional and have been chosen based upon estimated flood depths from the CFRAM modelling. It is noted that completion of the Poddle Flood Alleviation Scheme will aim to provide protection to 1%AEP flood levels, thereby rendering these measures largely redundant. Plate 3 shows the practical utility of the recommended devices.

Table 6 Flood resistance measures

Item	Details	Description	Comment
De-mountable door barriers	Provide protection to 600mm	At property thresholds, these provides a temporary barrier to water ingress	Recommend 'Dam Easy' portable barrier. A ready-to-use product" domestic flood barrier with a pneumatic pump action seal. The barrier can extend from 780mm - 1100mm.
Synthetic Sandbag	Provide protection to 1000mm	At property thresholds, these provides a temporary barrier to water ingress	Recommend 'Flood Guard' synthetic sandbags. Each unit is 500mm by 450mm. Each layer of Flood Guard will keep around 20cms (8ins) of water out.
Window barriers	Suitable where sill levels < door barrier	Provide a temporary barrier to water ingress	-
Pump	Electric portable pump	Method to expel water from inside the building, particularly useful for lower flood levels inundating the building floor	-
Toilet bungs	-	Fitted by hand into toilet u-tube to prevent backing up in event of flooding	Recommend having these available for ground-floor.

Plate 4 Flood Resilience measures: De-mountable 'Dam Easy barrier' and 'Flood Guard' synthetic sandbags (stackable to 1metre)

4.6 Conclusions & Recommendations

This site-specific flood risk assessment examined the flood potential, and risk of flooding at the site of the proposed three bed detached sustainable two-storey house; a new vehicular/pedestrian entrance; two car driveway; all associated site boundaries, landscaping, drainage, new foul water connection, and ancillary works. The site is located at 42 Whitehall Road, Terenure, Dublin D12YR60. This report considered mitigation measures and the impact of flooding elsewhere due to the development. It took the form of a *Stage 1 Flood risk identification* and *Stage 2 Initial flood risk assessment using published modelling data*.

<u>*Summary of findings*</u>

The River Poddle was identified as a potential source of flooding to the site. Predictive flood maps from the Eastern CFRAM UoM09 study and the South Dublin SFRA place the site within a fluvial flood zone. There are some historical records of flooding near the site, with indications that neighbouring properties affected. Pluvial and groundwater flooding were eliminated as potential flood mechanisms at the site. A Stage 2 initial flood risk assessment was completed to confirm flood extent and levels using published data.

Using the CFRAM UoM9 study data, the predicted flood levels at the nearest relevant node (showing a direct conduit to the site) reach 52.75mOD for the 1%AEP fluvial flood, and 52.87mOD for the 0.1%AEP fluvial flood. The flexible mesh hydraulic model predicted flood depths for both 1%AEP and 0.1%AEP scenarios to be in the region of 0-25cm at the site location, suggesting a maximum flood level of ~ 48.0mOD.

The River Poddle Flood Alleviation Scheme is currently in progress. On completion, the subject site will be protected from flood waters. The scheme aims to contain surcharged flows up to the 1%AEP flood plus allowance for culvert blockage and freeboard. The marginal differences between 1/100 and 1/1000 flood levels suggest that once complete, the flood risk to the site will be remote.

The finished flood level of the proposed development is proposed at 47.95mOD, +200mm above road levels (47.75mOD). Although this does not reach the ideal flood defence level of 500mm freeboard based on current modelling; the risk of flood waters inundating the dwelling is very low based on predicted flood depths to 48.0mOD. A justification test for development was compiled as per the guidelines. In the interim, flood resistance measures are suggested. Primary flood resistance measures were recommended as de-mountable 'Dam Easy barrier' and 'Flood Guard' synthetic sandbags to be retained and implemented at access doors in the event of flooding.

Detailed foul and surface water management proposals have been submitted with the application. Runoff will be routed to the public surface water sewer, an wastewater to the foul sewer. The development does not remove areas of flood storage, displace flow paths, or contribute to additional runoff given the existing footprint. SuDS measured were advised to manage surface runoff. These entail bio-retention planters connected to downpipes, and permeable paving for the drive/parking area.

To summarise, the proposed development is deemed suitable regarding the relevant objectives within the South Dublin County development plan 2022-2028 and the Planning Systems and Flood Risk Management guidelines (OPW, 2009).

5.0 References

GSI. *Groundwater/Geological Maps*. www.gsi.ie. Accessed: July 2023

Flood Studies Update (FSU). *Web Portal*. Accessed: July 2023

OPW. 2009. *The planning system and flood risk management*.

OPW. Floodinfo.ie. *Floodmaps*. Accessed: July 2023

South Dublin *SFRA 2022-2028*

CFRAM study UoM 9 – Hydrology & Hydraulics Reports

River Poddle flood alleviation scheme. *Poddlefas.ie*. Accessed: July 2023

Appendix A: Justification Test for Development

When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2 for the guidelines, and the following criteria must be satisfied:

- 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 these Guidelines.:

The lands for the proposed dwelling are zoned correctly for residential development.

- The proposal has been subject to an appropriate flood risk assessment that demonstrates: The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk:

The proposed dwelling does not displace significant quantities of flood storage as to impact flooding elsewhere. The pending Poddle flood alleviation scheme will likely eliminate this issue entirely.

- The development proposal includes measures to minimise flood risk to people, property, the economy, and the environment as far as reasonably possible:

The flood risk to the dwelling is low given current modelling of flood depths surrounding the site. The estimated levels (0-25cm) do not suggest a risk to life or likely cause any significant infrastructure damage.

- 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:

Residual risks are managed through (1) implementing SuDS measures for surface runoff and (2) ensuring the availability of removable door barriers and sandbags as interim measures until completion of the flood alleviation scheme.

- The development proposed addresses 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:

The dwelling appears compatible with the wider planning objectives, particularly in relation to delivering higher densities whilst mitigating urban sprawl, but also in terms of place-making and sustainable movement.

Clima-Pave™

The rapid development of previously green-field sites and the associated creation of impermeable areas such as roofs, car parks and footpaths will mean that at project conception stage there will be potentially large volumes of surface water to be dealt with. Traditionally this has been done by piping the surface water into storage tanks or discharging it into nearby streams or surface water drainage. This method of drainage is not currently favoured by planners and designers, as it simply moves the surface water downstream where it still has to be dealt with. This is especially important where large volumes of water need to be dealt with during heavy rainfall events. Piping large volumes of water into streams and rivers increases the risk of flooding and also allows for the potential pollution of local water courses and drinking water supplies.

Sustainable Urban Drainage Systems (SUDS) and Water Source Control

Planners are encouraging the use of Sustainable Urban Drainage Systems (SUDS) in all new developments, in particular the use of appropriate source control techniques is important as this allows for the containment of the surface water collected on the site and for this surface water to be dealt with on-site as opposed to traditionally draining it off-site. SUDS, as a sustainable development approach to Surface Water Design Techniques, has the aim of balancing the following:

1. **To manage water run-off from developed areas to similar quantities prior to development (Source Control)**
2. **Reduce and avoid incidences of downstream flooding**
3. **To protect or enhance water quality of the run-off**
4. **To improve or enhance the amenity where possible**

› Advantages of Permeable Paving

- Permeable Paving is a 'source control' method. Water is managed and dealt with on-site without piping off to storage tanks or surface water treatment systems
- The Water Framework Directive (Directive 2000/60/EC) requires that surface water discharges are managed to ensure that risk of contamination or pollution are mitigated. Permeable paving systems filter contaminants by microbial action. There is no requirement for additional filtering/polishing with Permeable Paving in normal use
- Separate attenuation tank systems are not required
- No need for gullies or channels or conventional drainage
- Recharges ground water
- Roofs, roads and other non-permeable areas can be discharged into permeable paving (No gullies required)
- No ponding or surface water
- Collected water can potentially be re-used for non-potable purposes
- Improves water quality

Clima-Pave™, the permeable paving solution from Kilsaran, offers an advantage over traditional SUDS techniques, such as storm water attenuation tanks. This is because the stone based sub-base, which needs to be installed for any type of surfacing material, is adapted to an open graded material in permeable paving systems. This allows the water collected from the site to be stored in the pavement and either infiltrated back into the ground or discharged at a controlled rate into the surface water drainage system.

The Clima-Pave™ system is constructed using our specially engineered permeable paving block, which has enlarged joints on all sides, typically 4-8mm in width. When the blocks have been laid, a corresponding slot is formed between the paving blocks which are then filled with a clean 3mm aggregate. This allows water to rapidly drain from the surface down into the pavement.

Traditional block paving is laid on a sand bedding layer and a Type 1/CL. 804 sub-base. To allow for storage and infiltration of the surface water percolating through the block, permeable block paving is laid on a grit laying course instead of sand and an open-graded stone sub-base instead of Type 1/CL. 804.

Clima-Pave™

Permeable Paving Solutions

Advantages of Clima-Pave™ for your project

Clima-Pave™ from Kilsaran offers the widest range of permeable paving products for use in commercial, retail and civic projects.

Kilsaran can also offer a full site-specific permeable paving design for your project, taking into account the site ground conditions, drainage requirements and structural and traffic loading requirements for the site. This is a chargeable service and Kilsaran will provide an indemnified design provided by our nominated Consulting Engineer who will visit the site if required to appraise the installation.

Bioretention Planters

Tournesol SITEWORKS

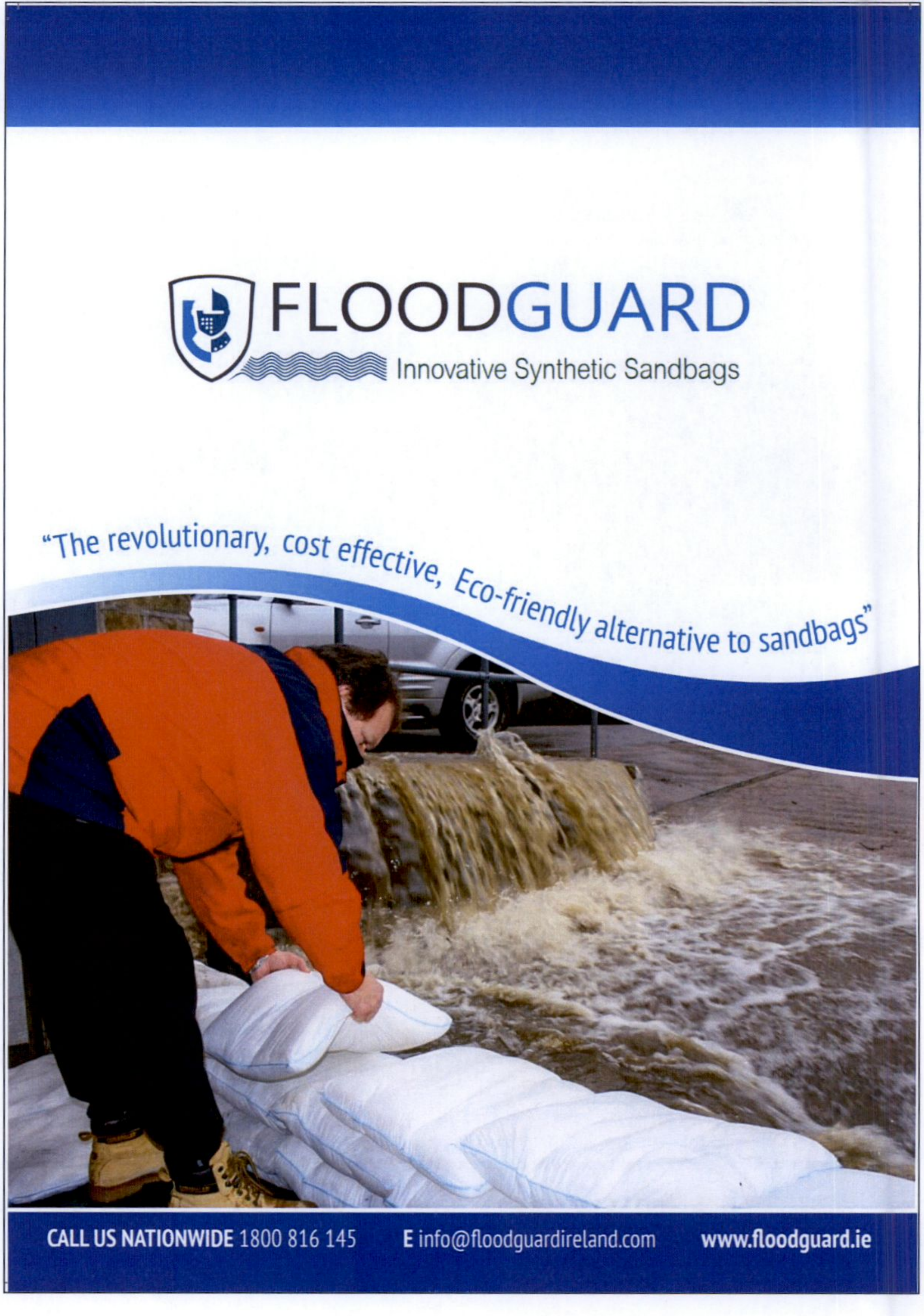
Solutions to manage on-structure Stormwater Filtration

Materials: **GFRC Concrete**

Bioretention (also referred to as flowthrough) planters act as an on-structure organic filter for stormwater systems. Tournesol Siteworks offers several standard configurations as well as custom designs to meet your specific application. The bioretention planters are available in lightweight GFRC and feature an internal waterproof sealant and 4" diameter drainage plumbing. Bioretention media is typically specified by local authorities or to code.

Custom Bioretention Wilshire Planters

- Fully engineered Bioretention plumbing system - just add media & plants.
- Allows the use of reliable monolithic membrane waterproofing below, while avoiding complicated and expensive cast-in-place construction.
- Standard sizes and custom configurations available.
- Ability to match planters by color & shape with complimentary benches & site furnishings.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"The revolutionary, cost effective, Eco-friendly alternative to sandbags"
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How Flood Guard works

When floods strike you have little time to act.

Flood Guard units are transformed from being as light as a pillowcase to become as tough and heavy as sandbags within minutes.

All you need to do is pour water on them or pop them in a container, add 20 litres of water and watch them expand.

Flood Guard units are lightweight, weighing just 700grammes before taut, weighing 20kg (44lbs) in just over 3 minutes. They can be expanded in waters in a bath, a sink, a bucket, a hosepipe or even the floodwater.

Flood Guard units will be ready for action anytime, any place and anywhere, unlike Sandbags that need vast warehouse storage space, are heavy and expensive to shift and require huge manpower and lorries to get them to the scene.

Countries worldwide are being devastated by floods. In October 2011 there was wide scale flooding across the Dublin and Cork regions that arose from intense rainfall over a relatively short period of time. This caused rivers to break their banks, drainage systems over flowed onto streets causing flood damage to over 2000 homes and commercial properties.

Anyone can face a flooding emergency inside their home such as a burst pipe at any time or a flash flood and surface water run off from the outside. The semi-porous inner liner with **Flood Guard** units contain gelling polymer which absorb water. They are designed so they mould into doorways and across air vents to keep floodwater out.

In short, **Flood Guard** units take away the risk and are incredibly easy to deploy.

Who Uses Flood Guard?

Some of our major customers include local councils, shopping centres, emergency services, environmental agencies, banks and IT centres to protect computer servers, bus and train stations, hotels, hospitals, nursing homes, restaurants, schools, colleges, universities, the construction industry and public utilities such as gas, electricity, water and telecoms.

Our products are also available in the UK, where they have been endorsed by the National Disabled Fire Association as the frail and elderly find them so easy to store, move and deploy.

When is Flood Guard used?

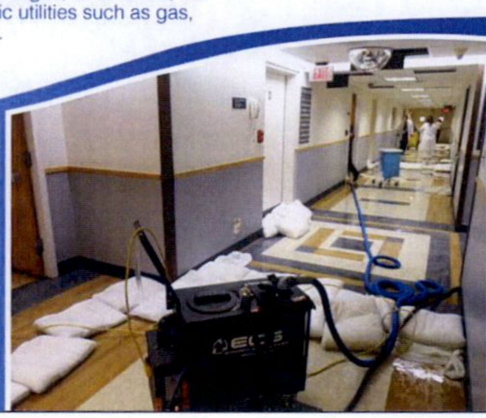
Flood Guard units are used to stop floodwater either by forming into a wall or as a highly effective barrier in doorways or across air vents. They can divert surface water away from properties and down drains or into water courses.

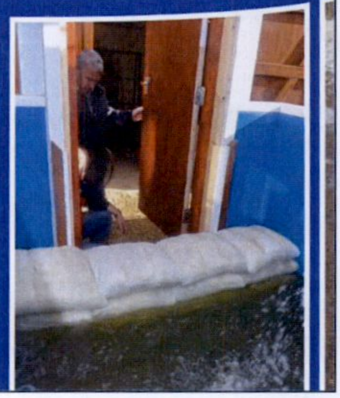
Inside the home they can soak up leaks from faulty domestic appliances ranging from boilers to washing machines, fridges, broken pipes and radiators. It means no mess and no trying to get a bucket or a bowl in an impossible-to reach place.

Businesses also find them ideal to have for an emergency such as after a sprinkler system failure or to a quickly soak up spilled fluid to prevent staff and customers from slipping.

Let's get technical - Flood Guard sizes

Our **Flood Guard** unit is 500mm by 450mm, absorbs 20 litres of water and so weighs 20 kilos when energising. Each layer of **Flood Guard** will keep around 20cms (8ins) of water out.





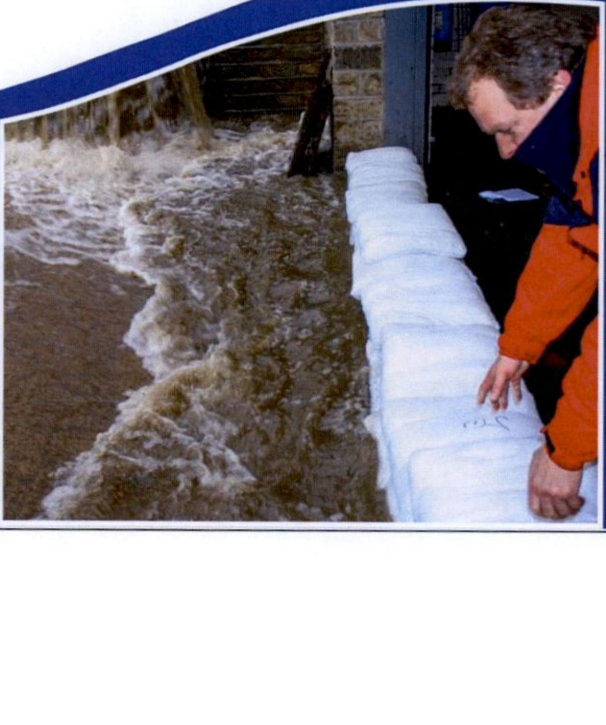
Sandbags vs Flood Guard

What's so wrong with conventional sandbags?

- Must be replaced regularly costing thousands of pounds for the big companies and local authorities that need palletised sandbags ready all year round for any emergency.
- Can deteriorate if stored for a long time, especially in cold, damp warehouses. Dust and grime infiltrate anything stored nearby.
- Exceptionally unwieldy to lift and handle with all kinds of health, safety and manual handling technical problems for staff who have to use them at businesses.
- Messy with the sand easily washed out and adding to all the damage if they burst.
- Difficult and expensive to transport anywhere due to their weight. One box of 20 **Flood Guard** units is equal to 20 sandbags on a pallet and the number of **Flood Guard** units that can be delivered by a pick-up truck is equal to more than 12,000lbs of sand.
- Odd shapes, uneven bags and poor stacking performance means sandbags let water seep through and are ill-suited to the task. You need a lot of people to move any number of sandbags anywhere.
- Cleaning up after sandbags can cost a fortune, especially if they have leaked as spilled sand can have a disastrous effect on natural habitats.

What's so right about Flood Guard?

- Easy to store and can be vacuumed-packed to save even more room.
- Always there for peace of mind. No panic to buy sandbags if a flood is forecast.
- Can be expanded in water right next to where you need them and stay taut until flood subsides for up to 3 months.
- Lightweight before they are used, with the standard bag weighing just 700grammes. **Flood Guard** can be used by people who would not be able to lift sandbags.
- Thousands can be quickly transported in a van, saving on fuel, wages and manpower.
- Can be stored in small depots around the area, not one huge central store, therefore can be taken even more quickly to the scene.
- One **Flood Guard** unit can be expanded and put down the toilet to block it from filthy water being forced up the drains and sewer.
- Unlike sandbags, **Flood Guard** soak up some oils and chemicals.
- **Flood Guard** are uniform sizes so expand to fit tightly against each other and walls, providing dependable protection from water.
- **Flood Guard** don't need sand (one of the earths natural resources) and therefore is Eco-friendly.



Residential Flood Barrier

DAM EASY®

A ready-to-use flood barrier for doors & entryways that can easily be installed in under 5 minutes.

There's no need for damaging hardware, adhesives or permanent fixtures when using Dam Easy—simply place between an entryway, extend the sides to fit the opening, and inflate the built-in tube. This simple solution replaces the time, energy, and mess associated with sandbags and can be installed in under 5 minutes.

Applications

Residential & Commercial Doorways | Garages | Patio Doors

info@floodproofing.com | 1 (800) 507 0865

Ready to Use. Easy to Install. Simple to Store.

HEIGHT	PROTECTION HEIGHT	WIDTH	DEPTH	WEIGHT
29.5"	28.34"	30.7"-43.4"	2.5"	45 lbs

Needs 36" of clearance above for pump mechanism

Extension Poles Available. Some Installation Required.

A core-drilled hole and anchor rod is required for initial installation and allows for the quick placement & removal of the extension pole. A cap covers the opening when not in use.

1 POLE	2 POLES	3 POLES	4 POLES
2 BARRIERS	**3 BARRIERS**	**4 BARRIERS**	**5 BARRIERS**
64.5"-89.725"	98.35"-136.15"	132.175"-182.575"	166"-229"

FEATURES

Convenient
Deploys in Under 5 Minutes

Easy To Install
No Permanent Fixtures

Standardized
Fits Most Regular Openings

Connectable
Extension Poles for Wider Openings

Compact
Minimal Storage Needed