Flemington Local Area Plan

Adopted by Council on 9th December 2024

Appendix III:

Surface Water Management Plan (Strategic Flood Risk Assessment & Sustainable Drainage Strategy)

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1 INTRODUCTION

1.1 Terms of Reference

This Strategic Flood Risk Assessment (SFRA) forms the first part of a Surface Water Management Plan (SWMP) commissioned by Fingal County Council (Fingal CC) to inform the Flemington Local Area Plan (LAP). The lands at Flemington are hereafter referred to as 'the Plan Area'.

1.2 Statement of Authority

This assessment and report have been prepared and reviewed by the following qualified professionals:

- Duncan Hartwick *BEng (Hons) BSc (Hons)* – Senior Engineer specialising in hydrology, flood risk assessment, hydraulic modelling, and SuDS design.
- Paul Singleton *BEng (Hons) MSc CEng MIEI* – Associate Director and Chartered Engineer specialising in flood risk assessment, hydrology, surface water management, and SuDS design, and a recognised industry professional providing training courses on these topics to the public and private sectors in Ireland and the UK.
- Kyle Somerville *BEng (Hons) CEng MIEI* – Director and Chartered Engineer specialising in flood risk assessment, hydrology, hydraulic modelling, surface water management, and SuDS design.

1.3 Purpose and Scope

The purpose of the SFRA is to identify all potential sources of flooding within the Plan Area and assess their associated risk to people and property. The SFRA also aims to determine the suitability of the Plan Area for future development and set out appropriate flood protection and mitigation measures where appropriate.

The SFRA presented herein comprises a Stage 1 through Stage 3 Flood Risk Assessment (FRA), as defined in 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities' (the OPW Guidelines) and accompanying Technical Appendices published in 2009 by the Office of Public Works and Department of Environment, Heritage, and Local Government.

This report will allow Fingal CC to apply the sequential approach and, where necessary, the Justification Test to identify appropriate areas / sites within the Plan Area for development and identify how flood risk can be reduced as part of the LAP process.

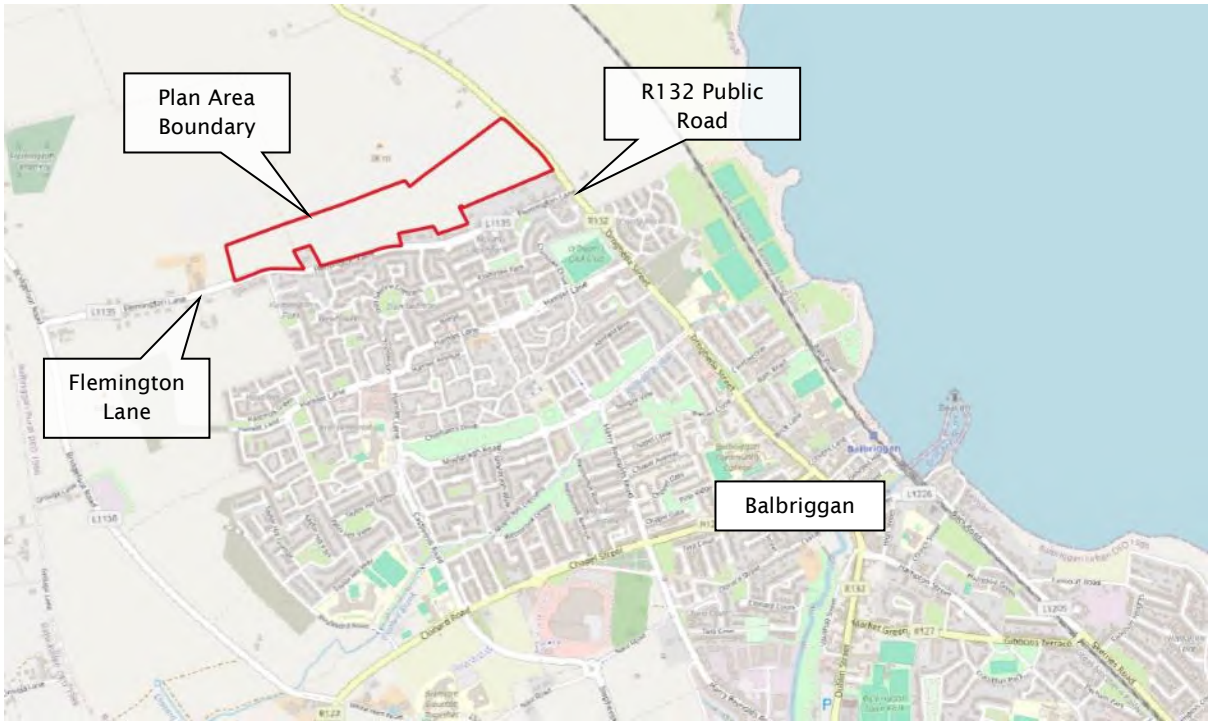
This assessment is intended for 'plan making' only and is not intended to assess the risk to development proposals. Risk to any future developments within the Plan Area would be assessed separately by Site-Specific Flood Risk Assessments (SSFRAs) submitted in support of planning applications. While any future SSFRA may be informed by flood hazard information determined by this assessment, it would need to be made specific to a proposed development.

2 PLAN AREA INFORMATION

2.1 Location and Boundary

The Plan Area is located at Flemington, north of Balbriggan, as shown in Figure 2.1. Flemington Lane is to the south of the Plan Area, and the R132 public road runs along the eastern boundary.

Figure 2.1: Plan Area Location and Boundary



2.2 Existing Land Use

The Plan Area has an area of c. 17.4 ha and currently comprises primarily agricultural land, as shown in Figure 2.2.

Figure 2.2: Existing Land Use

2.3 Zoning Objectives

Notwithstanding the particular objectives of the LAP that this SFRA is intended to inform, the zoning objectives for the Plan Area based on the 'Fingal Development Plan 2023-2029' (Fingal CDP) include 'Residential Area', as shown in Figure 2.3 and described in Table 2.1. The Plan Area is surrounded by lands with various other zoning objectives.

Figure 2.3: Zoning Objectives from the Fingal Development Plan 2023-2029

Table 2.1: Land Use Zoning Objectives from the Fingal Development Plan 2023-2029

Zoning Objective Type	Zoning Objective Description
GB – Green Belt	Protect and provide for a Greenbelt.
HA – High Amenity	Protect and enhance high amenity areas.
OS – Open Space	Preserve and provide for open space and recreational amenities
RA – Residential Area	Provide for new residential communities subject to the provision of the necessary social and physical infrastructure.
RS – Residential	Provide for residential development and protect and improve residential amenity.
RU – Rural	Protect and promote in a balanced way, the development of agriculture and rural related enterprise, biodiversity, the rural landscape, and the built and cultural heritage.

2.4 Water Environment

No watercourses or open channels are present within or directly adjacent to the Plan Area as shown on OSI / EPA mapping datasets and confirmed during a site walkover.

The Plan Area is located c. 600 m west of the Irish Sea.

2.5 Geology and Hydrogeology

Refer to Section 2.6 of the Sustainable Drainage Strategy (SDS) portion of the SWMP.

2.6 Existing Utilities

Refer to Section 2.7 of the SDS.

3 APPROACH TO FLOOD RISK ASSESSMENT

3.1 Definition of Flood Risk

Flood risk is a combination of the likelihood of occurrence of a flood event and the potential consequences arising from that flood event. It is expressed as follows:

Flood Risk = Likelihood of Flooding x Consequences of Flooding

Flooding presents a risk only when people, property, infrastructure, and / or environmental assets are located in the area that could potentially flood.

3.1.1 Likelihood of Flooding

The likelihood of flooding is defined in the OPW Guidelines as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is generally expressed as an Annual Exceedance Probability (AEP) or return period. For example, a 1% AEP flood event refers to a flood with a magnitude that has a 1-in-100 (i.e., 1%) chance of occurring or being exceeded in any given year. AEP is the inverse of return period, as shown in Table 3.1.

Table 3.1: Return Period and Annual Exceedance Probability

Return Period (Years)	Annual Exceedance Probability (%)
1	100
10	10
50	2
100	1
200	0.5
1000	0.1

3.1.2 Consequences of Flooding

The consequences of flooding are determined by the hazards associated with the flooding (e.g., depth of water, speed, flow, rate of onset, duration, wave action, water quality) and the vulnerability of the people, property, and environment assets potentially affected (e.g., age profile of the population, type of development, presence, reliability of mitigation measures).

3.2 Objectives of the OPW Guidelines

This SFRA recognises the core objectives of the OPW Guidelines, which are to:

- Avoid inappropriate development in areas that are at risk of flooding.
- Prevent new developments from increasing flood risk elsewhere, including flood risk that may arise from surface water runoff.
- 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 that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

In achieving the aims and objectives of the OPW Guidelines, Fingal CC should:

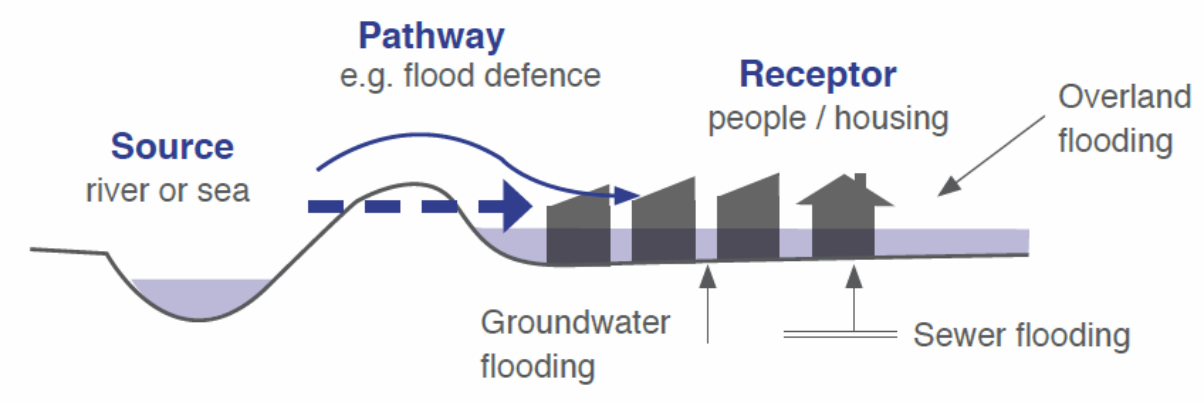
- Adopt a sequential approach to flood risk management, which aims to avoid flood risk where possible, substitute less vulnerable uses where avoidance is not possible, and mitigate and manage the risk where avoidance and substitution are not possible.
- Apply the Justification Test for development in flood risk areas.

A precautionary approach should also be applied to flood risk management to reflect uncertainties in existing flooding datasets and risk assessment techniques and in the ability to predict the future climate, the future performance of existing flood defences, and the extent of future coastal erosion. Development should therefore be designed with careful consideration of likely future changes in flood risk, including the effects of climate change and coastal erosion, to ensure that future occupants are not subject to unacceptable risks.

3.3 Source-Pathway-Receptor Model

In accordance with the OPW Guidelines, this SFRA advocates the use of the Source-Pathway-Receptor model to identify the sources of flooding (e.g., high sea levels, intense or prolonged rainfall leading to increased runoff and increased flows in rivers and sewers), the receptors (i.e., the people and assets affected by flooding), and the pathways by which floodwater reaches those receptors (e.g., overland flow, river and coastal floodplains, river channels and sewers). A depiction of the Source-Pathway-Receptor model as it applies to FRAs, taken from the OPW Guidelines, is shown in Figure 3.1.

Figure 3.1: Sources, Pathways, and Receptors of Flooding



3.4 Flood Zones

Flood Zones are geographical areas where the likelihood of flooding (from rivers and sea only) is within a certain range. The OPW Guidelines and Fingal SFRA define three Flood Zones, as outlined in Table 3.2.

Table 3.2: Flood Zones

Flood Zone	Description	Probability (Rivers)	Probability (Sea)
A	Probability of flooding from rivers and sea is highest	Greater than 1% or 1-in-100	Greater than 0.5% or 1-in-200
B	Probability of flooding from rivers and sea is moderate	Between 0.1% or 1-in-1000 and 1% or 1-in-100	Between 0.1% or 1-in-1000 and 0.5% or 1-in-200

Flood Zone	Description	Probability (Rivers)	Probability (Sea)
C	Probability of flooding from rivers and sea is low (any parts of the Plan Area not in Flood Zone A or B)	Less than 0.1% or 1-in-1000	Less than 0.1% or 1-in-1000

When determining Flood Zones, the presence of flood defences should be ignored as areas protected by flood defences still carry residual risk associated with overtopping or breach of defences.

Flood Zones are generated without the inclusion of allowances for climate change. Therefore, land zoning based on delineated Flood Zones will not account for climate change flood extents, which will be wider than the present day scenario flood extents in most instances.

3.5 Receptor Vulnerability

The OPW Guidelines define three vulnerability classifications for different land uses and types of development: highly vulnerable (including essential infrastructure), less vulnerable, and water compatible. Examples of different land uses and types of development under each classification are provided in Table 3.3.

The vulnerability of a development to flooding depends on the nature of the development, its occupancy, and the construction methods used. The classifications are primarily based on the ability to manage the safety of people in flood events and the long-term implications in terms of the recovery of function and structure of the development.

Table 3.3: Receptor Vulnerability Classifications

Vulnerability Classification	Land Uses / Type of Development *
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 • 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 in the event of flooding (SEVESO sites, IPPC sites, etc.)
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 • Local transport infrastructure.

Vulnerability Classification	Land Uses / Type of Development *
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 • Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan)

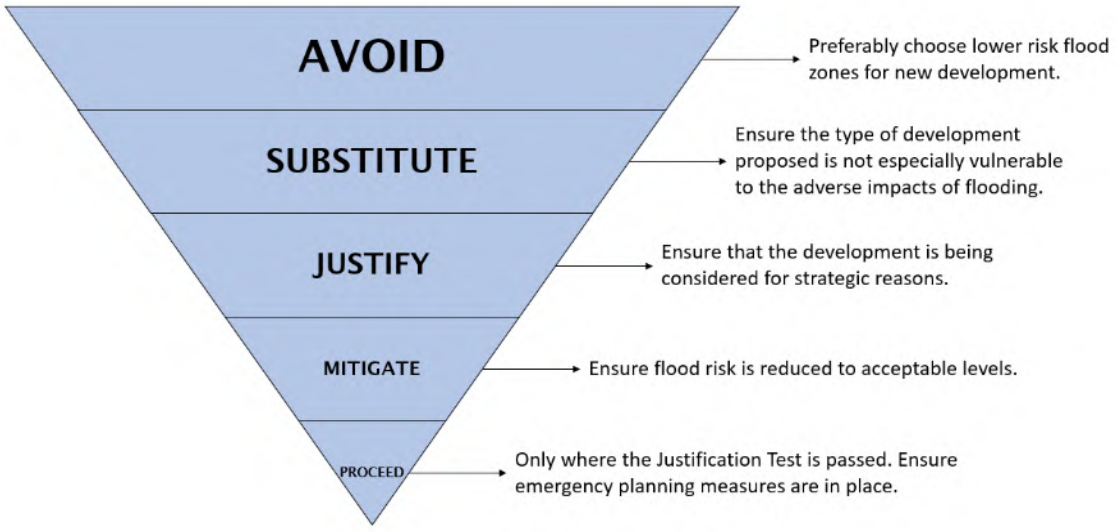
** Uses not listed here should be considered based on their own merits.*

3.6 The Sequential Approach and Justification Test

3.6.1 Sequential Approach

This SFRA recommends a sequential approach to planning to ensure the core objectives of the OPW Guidelines outlined in Section 3.2 are implemented. A sequential approach is particularly important at the plan-making stage but also applicable in the layout and design of new development at the development management stage. The principles of the sequential approach in flood risk management are summarised in Figure 3.2.

Figure 3.2: The Sequential Approach



In general, most types of development would be considered inappropriate in Flood Zone A.

In Flood Zone B, highly vulnerable development (e.g., hospitals, dwelling houses, and primary infrastructure) would be considered inappropriate, but less vulnerable development (e.g., retail, commercial, and industrial uses) may be considered appropriate.

Development in Flood Zone C is considered appropriate from a flood risk perspective.

While preferred, a sequential approach to flood risk management is not always possible as many urban centres are affected by Flood Zones yet are targeted for key social and economic development. To reflect this, the OPW Guidelines set out the Justification Test to facilitate the assessment of the balance between consideration of flood risk and the need for continued development in towns and cities.

3.6.2 Justification Test

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of particular developments that, for the reasons outlined above, are being considered in areas of moderate or high flood risk. The test is comprised of two processes:

- Plan Making Justification Test – used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land that is at moderate or high risk of flooding
- Development Management Justification Test – used at the planning application state 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

Table 3.4 is a matrix of receptor vulnerability versus Flood Zone to illustrate appropriate development and scenarios where development is required to meet the Justification Test.

Table 3.4: Vulnerability and Flood Zone Matrix for Justification Test

Development Vulnerability	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less Vulnerable	Justification Test	Appropriate	Appropriate
Water-compatible	Appropriate	Appropriate	Appropriate

3.6.3 Plan Making Justification Test

The Plan Making / Development Plan Justification Test should be carried out as part of the SFRA using mapped Flood Zones. It applies where land zonings have been reviewed with respect to the need for development of areas at a high or moderate risk of flooding for uses which are vulnerable to flooding and which would generally be inappropriate, as set out in Table 3.2, and where avoidance or substitution is not appropriate. Where land use zoning objectives are being retained, they must satisfy all of the following criteria as per Table 3.4 of the OPW Guidelines included as Table 3.5.

Table 3.5: Plan Making Justification Test

No.	Criteria
1	The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act, 2000, as amended.

No.	Criteria
2	The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular: • Is essential to facilitate regeneration and / or expansion of the centre of the urban settlement • Comprises significant previously developed and/or under-utilised lands • Is within or adjoining the core of an established or designated urban settlement • Will be essential in achieving compact and sustainable urban growth • There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement
3	A flood risk assessment to an appropriate level of detail has been carried out as part of the Strategic Environmental Assessment as part of the development plan preparation process, which demonstrates that flood risk to the development can be adequately managed, and the use or development of the lands will not cause unacceptable adverse impacts elsewhere. N.B. The acceptability or otherwise of levels of any residual risk should be made with consideration for the proposed development and the local context and should be described in the relevant flood risk assessment.

In cases where existing zoned lands are discovered to be within flood zones, the Development Plan Justification Test has been applied, and it is demonstrated that it cannot meet the specified requirements it is recommended that planning authorities reconsider the zoning by implementing the following:

- Remove the existing zoning for all types of development on the basis of the unacceptable high level of flood risk
- Reduce the zoned area and change or add zoning categories to reflect the flood risk
- Replace the existing zoning with a zoning or a specific objective for less vulnerable uses
- Prepare a local area plan informed by a detailed flood risk assessment to address zoning and development issues in more detail and prior to any development

If the criteria of the Justification Test have been met, design of structural or non-structural flood risk management measures as prerequisites to development in specific areas, ensuring that flood hazard and risk to other locations will not be increased or, if practicable, will be reduced. The mitigation measures are required prior to development taking place.

3.7 Climate Change Adaptation

It is likely that climate change will have an impact on flood risk in Ireland as a result of rising sea levels and more frequent extreme rainfall events. Climate change is a dynamic process and therefore requires a precautionary and flexible approach to ensure appropriate provision for or adaptation to its potential consequences.

Guidance on climate change objectives and actions is set out in the 'Flood Risk Management Climate Change Sectoral Adaptation Plan' published by the OPW in 2019. The long-term goal adopted by the OPW on climate adaptation for flooding and flood risk management is "p*romoting sustainable communities and supporting our environment through the effective management of the potential impacts of climate change on flooding and flood risk*". To deliver this goal, the OPW has identified the following adaptation objectives:

- Objective 1 – Enhancing our knowledge and understanding of the potential impacts of climate change for flooding and flood risk management through research and assessment
- Objective 2 – Adapting flood risk management practice to effectively manage the potential impact of climate change on future flood risk
- Objective 3 – Aligning adaptation to the impact of climate change on flood risk and flood risk management across sectors and wider government policy

The OPW have adopted two indicative potential futures for assessing flood risk: the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). These were selected to reflect, based on information available at the time, a future in the latter part of the century that would be:

- typical or near to the general average of the future climate projections (MRFS), or
- a more extreme future based on the upper end of the range of projections of future climatic conditions and the impacts such changes would have on the drivers of flood risk (HEFS).

The allowances, in flood risk terms, for both the MRFS and HEFS are shown in Table 3.6. For the purposes of this SFRA, climate change flood mapping has been prepared and is included in Appendix C.

Table 3.6: OPW Climate Change Allowances

Parameter	Mid-Range Future Scenario (MRFS)	High End Future Scenario (HEFS)
Mean Sea Level Rise	+ 500 mm	+ 1000 mm
Peak River Flood Flows	+ 20%	+ 30%
Extreme Rainfall Depths	+ 20%	+ 30%

Due to the uncertainty of the potential effects of climate change, this SFRA sets out recommendations in line with the precautionary approach adopted by the Guidelines in terms of managing the effects of climate change. These include:

- Recognising that significant changes in the flood extent may result from an increase in rainfall or tide events and, accordingly, adopt a cautious approach to zoning land in transitional areas.
- Ensuring that the finished levels of structures are designed to protect against flooding such that flood defences, land raising, and ground floor levels are sufficient to cope with the effects of climate change over the lifetime of the development.
- Ensuring that both the structures designed to protect against flooding and the protected development are capable of adaptation to the effects of climate change when there is more certainty about the effects and when there is still time for such adaptation to be effective.

3.8 Stages and Scales of Flood Risk Assessment

3.8.1 Stages of Flood Risk Assessment

FRAs are typically undertaken over three stages, in order of increasing detail, as described in Table 3.7. Progression to a more detailed stage depends on the outcomes of the previous stage. This staged approach ensures that the level of assessment undertaken is appropriate for the scale and nature of the flood risk issues, site or area, and type of development proposed. It also prevents unnecessary flood modelling and development of mitigation and management measures.

Table 3.7: Stages of Flood Risk Assessment

Stage	Purpose
Stage 1: Flood Risk Identification	To identify whether there may be any flooding or surface water management issues relevant to a plan area or proposed development site that may warrant further investigation.

Stage	Purpose
Stage 2: Initial Flood Risk Assessment	To confirm sources of flooding that may affect a plan area or proposed development site and to appraise the adequacy of the existing flood risk information. If necessary, to determine what surveys and modelling approach are appropriate to match the spatial resolution required and complexity of the flood risk issues identified.
Stage 3: Detailed Flood Risk Assessment	To provide a quantitative assessment of flood risk to a proposed or existing development, the effect of the development on flood risk elsewhere, and the effectiveness of any proposed mitigation measures. Typically involves the construction of a hydraulic model that covers a wide enough area to capture catchment-wide impacts and hydrological processes.

3.8.2 Scales of FRA

There are three scales of FRA described in the OPW Guidelines, as described in Table 3.8.

Table 3.8: Scales of Flood Risk Assessment

Scale	Purpose	Responsibility
Regional Flood Risk Appraisal (RFRA)	• To appraise the source and significance of all types of flood risk in a region based on readily derivable information to inform the regional planning guidelines and influence spatial allocations for growth in housing and employment. • To identify areas where more detailed studies are required or where flood risk management measures may be required at a regional level to support the proposed growth.	Regional Authorities
Strategic Flood Risk Assessment (SFRA)	• To provide a broad assessment of all types of flood risk in the area to inform strategic land use planning decisions and to identify opportunities for reducing flood risk. • Typically involves up to a Stage 2 – Initial Flood Risk Assessment. • A site-specific flood risk assessment would be recommended where the initial flood risk assessment demonstrates the potential for a significant level of flood risk or where there is conflict with the vulnerability of proposed development.	Local Authorities

Scale	Purpose	Responsibility
Site-specific Flood Risk Assessment (SSFRA)	• To identify and assess all types of flood risk for a proposed new development and to assess the potential effects of climate change, the impact of development on flooding, and residual risks. • To propose appropriate site management and mitigation measures to reduce flood risk to an acceptable level. • If stages 1 and 2 of assessment have been undertaken to appropriate levels of detail, it is likely that the SSFRA will require detailed channel and site surveys and flood modelling.	Planning Applicants

3.9 Strategic Flood Risk Assessment

The purpose of this report is to carry out an SFRA at Plan Area scale. The following detailed requirements are set out in the Technical Appendices of the OPW Guidelines and have been undertaken where relevant information is available:

- Identify principal rivers, sources of flooding and produce Flood Zone maps for across the local authority area and in key development areas.
- An appraisal of the availability and adequacy of the existing information.
- Assess potential impacts of climate change to demonstrate the sensitivity of an area to increased flows or sea levels.
- Identify the location of any flood risk management infrastructure and the areas protected by it and the coverage of flood-warning systems.
- Consider, where additional development in Flood Zone A and B is planned within or adjacent to an existing community at risk, the implications of flood risk on critical infrastructure and services across a wider community-based area and how the emergency planning needs of existing and new development will be managed.
- Identify areas of natural floodplain, which could merit protection to maintain their flood risk management function as well as for reasons of amenity and biodiversity.
- Assess the current condition of flood-defence infrastructure and of likely future policy with regard to its maintenance and upgrade.
- Assess the probability and consequences of overtopping or failure of flood risk management infrastructure, including an appropriate allowance for climate change.
- Assess, in broad terms, the potential impact of additional development on flood risk elsewhere and how any loss of floodplain could be compensated for.
- Assess the risks to the proposed development and its occupants using a range of extreme flood or tidal events.
- Identify areas where site-specific FRA will be required for new development or redevelopment.
- Identify drainage catchments where surface water or pluvial flooding could be exacerbated by new development and develop strategies for its management in areas of significant change.
- Identify where an integrated and area based provision of SuDS and green infrastructure are appropriate in order to avoid reliance on individual site by site solutions.
- Provide guidance on appropriate development management criteria for zones and sites.

4 STAGE 1 – FLOOD RISK IDENTIFICATION

4.1 Preamble

This section is intended to form a Stage 1 assessment of flood risk by presenting available flood risk information used to identify flooding or surface water management issues within the Plan Area that warrant further investigation. In accordance with the OPW Guidelines, both primary and secondary sources of flood risk information have been used to inform this SFRA.

4.2 Primary Sources of Flood Risk Information

Table 4.1 lists primary sources of flood risk information in chronological order and indicates whether they are relevant to this SFRA. Sources deemed relevant are discussed further in this section.

Table 4.1: Primary Sources of Flood Risk Information

Information Source	Year Published	Findings	Relevant?
Fingal East Meath Flood Risk Assessment and Management Study (FEM FRAMS)	2010	The Plan Area and surrounding lands are included in flood mapping produced as part of the FEM FRAMS.	Yes – refer to Section 4.2.1
Catchment Flood Risk Assessment and Management (CFRAM) Study	2015 / 2016	CFRAM flood mapping does not include the Plan Area.	No
GSI Groundwater Flooding	2020	GSI historic groundwater flood extent mapping indicates that the Plan Area is not at risk of groundwater flooding.	No
National Indicative Fluvial Mapping (NIFM)	2021	The Plan Area and surrounding lands are not covered by NIFM flood maps.	No
National Coastal Flood Hazard Mapping (NCFHM)	2021	The Plan Area is not in an area affected by coastal flooding so is not covered by NCFHM flood maps.	No
Strategic Flood Risk Assessment for the Fingal Development Plan 2023-2029 (Fingal SFRA)	2023	The Fingal SFRA contains information relating to flood risk in the vicinity of the Plan Area and general advice relating to management of flood risk.	Yes – refer to Section 4.2.2

4.2.1 Fingal East Meath Flood Risk Assessment and Management Study

The FEM FRAMS is a pilot study undertaken for the National CFRAM Programme. The FEM FRAMS was commissioned in 2008 by Fingal CC in partnership with Meath CC and the OPW with the purpose of investigating flood risk in Fingal and East Meath.

Key outputs of the FEM FRAMS included detailed flood maps for high priority watercourses throughout Fingal and East Meath. The Bracken (Matt) River was considered a high priority watercourse and, as such, was modelled as part of the FEM FRAMS, as well as its tributaries. Three detailed flood extent maps were published in 2010, covering the full length of the Bracken (Matt) River to where the watercourse discharges to the Irish Sea at Balbriggan.

Draft versions of the flood extent maps showing the Plan Area were made available for the purposes of this SFRA. Extracts from the fluvial and tidal flood extent maps are shown in Figure 4.1 and Figure 4.2, respectively. The full flood map is included in Appendix A.

Figure 4.1: Extract from FEM FRAMS Fluvial Flood Extent Map

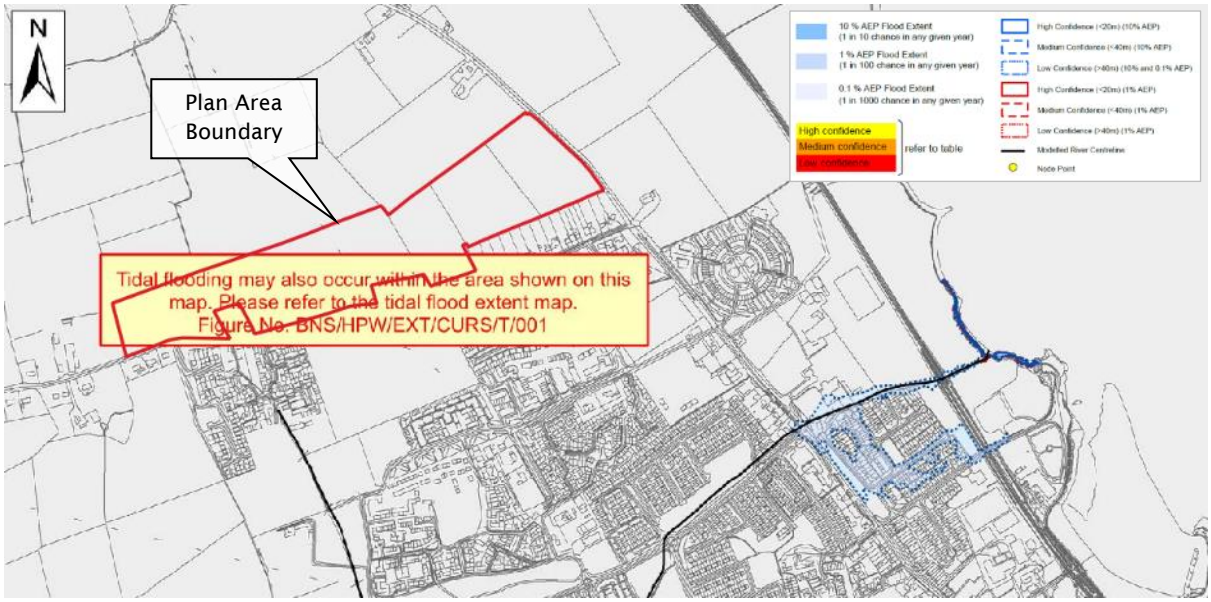
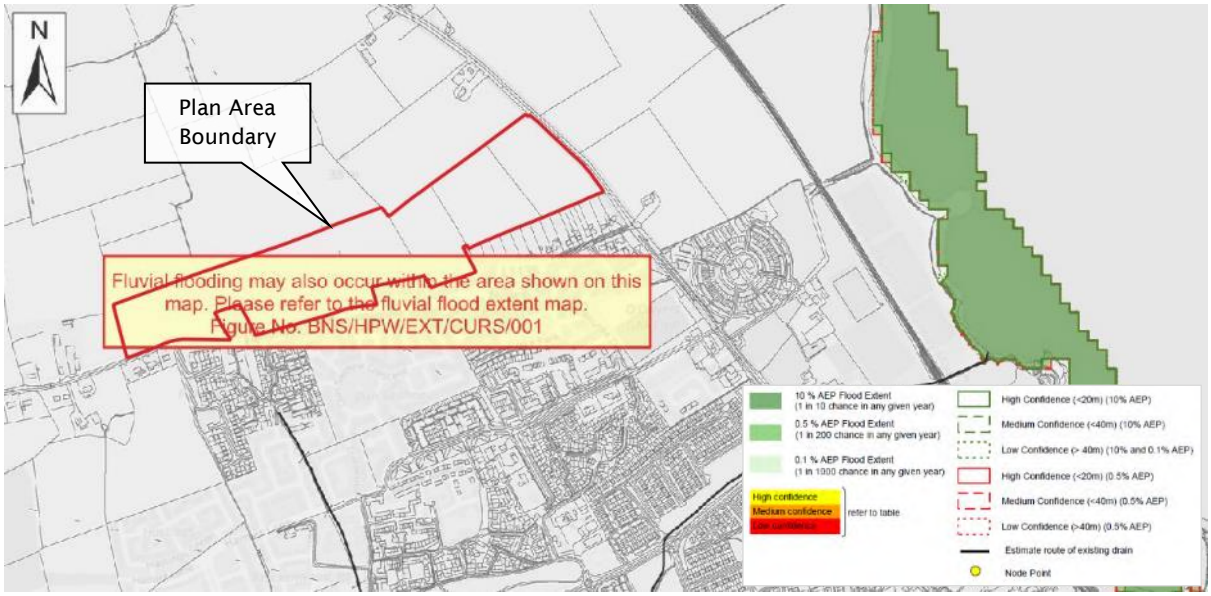


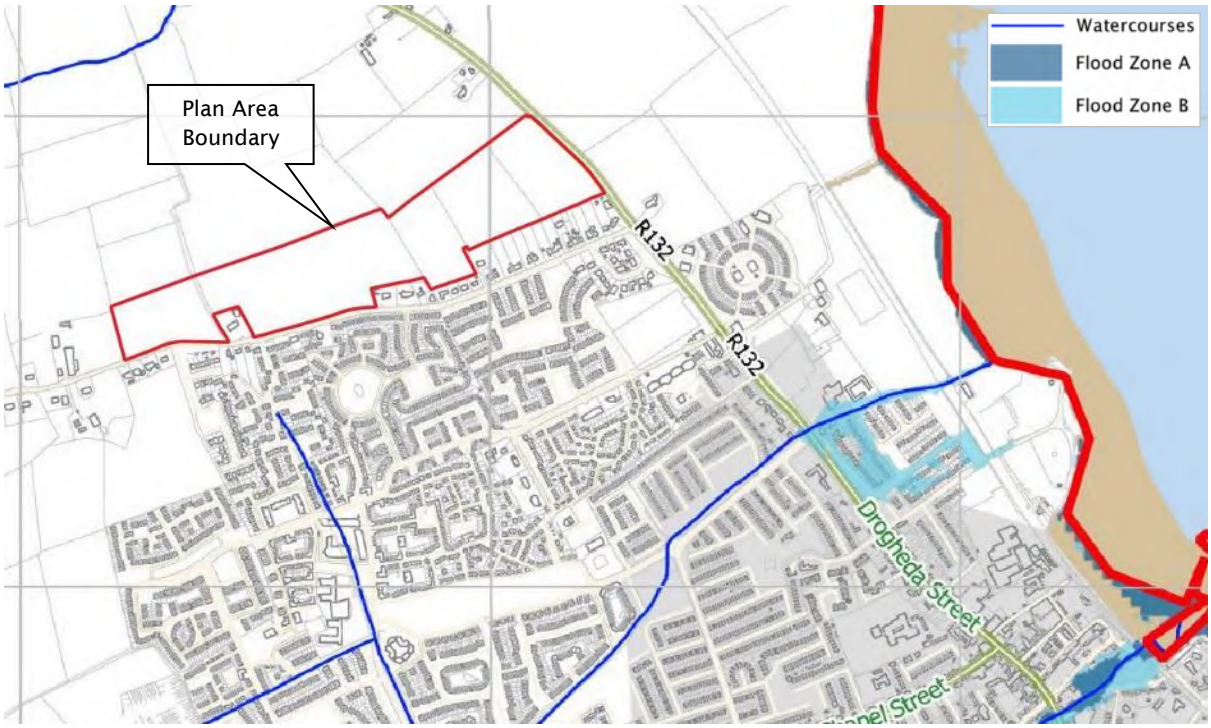
Figure 4.2: Extract from FEM FRAMS Tidal Flood Extent Map



4.2.2 Strategic Flood Risk Assessment for the Fingal Development Plan 2023-2029

Flood Zone mapping was produced as part of the Fingal SFRA, an extract of which is shown in Figure 4.3. The full flood map is included in Appendix A.

Figure 4.3: Extract from Fingal SFRA Flood Zone Mapping



The Fingal SFRA also includes the following guidance considered pertinent to this SFRA:

- Flood Zones represent flood extents for the existing, undefended present day scenario (i.e., without inclusion of climate change allowance or flood defences).
- Climate change projections are to be applied depending on the receptor vulnerability; HEFS is to be considered for 'highly vulnerable' development and MRFS is to be considered for 'less vulnerable' development.
- A key mechanism for providing flood protection and resilience is the setting of Finished Floor Levels (FFLs) and Finished Ground Levels (FGLs).
- In accordance with the OPW Guidelines, access to and egress from any development should be within Flood Zone C (i.e., outside the 0.1% AEP fluvial / coastal floodplain). Where this is not achievable due to on-site or off-site flood risk, a Flood Management Plan for the development will be required.

4.3 Secondary Sources of Flood Risk Information

Table 4.2 lists secondary sources of flood risk information and indicates whether they are relevant to this SFRA. Sources deemed relevant are discussed further in this section.

Table 4.2: Secondary Sources of Flood Risk Information

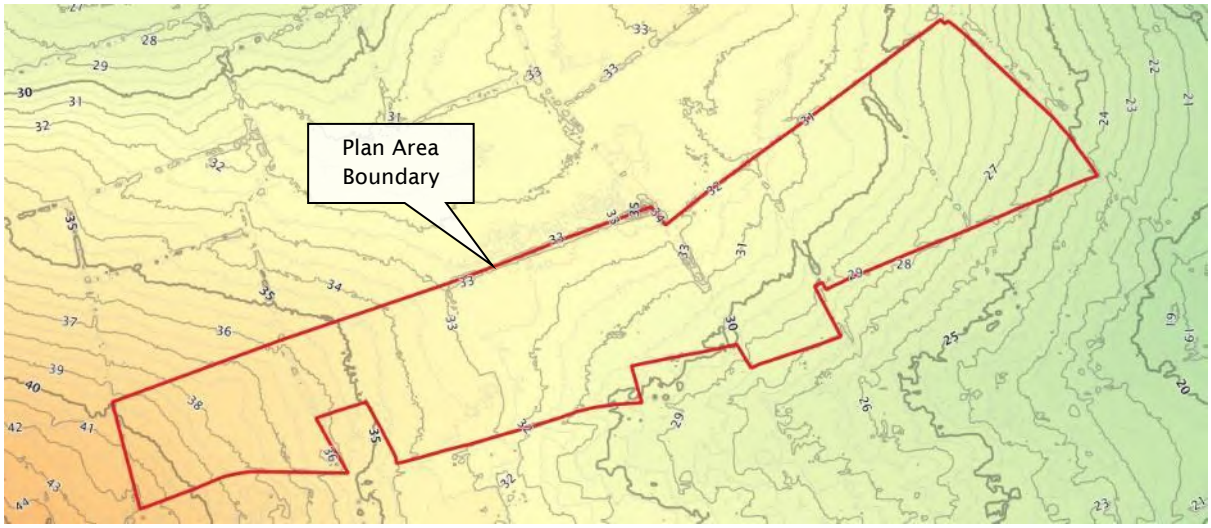
Information Source	Year Published	Findings	Relevant?
Internet Background Search	N/A	An internet background search including online news articles and other media found no evidence of flooding within the Plan Area.	No
Past Flood Events Mapping	Updated on Ongoing Basis	OPW 'Past Flood Events' database does not include any records of historic flooding of the Plan Area and surrounding area.	No
Topographical Data	Unknown	Best available height data has been obtained as part of this assessment.	Yes – refer to Section 4.3.1
Arterial Drainage Scheme Benefitting Lands	N/A	The Plan Area is not shown to be within an area of benefitting lands.	No
Drainage District Benefitting Lands	N/A	The Plan Area is not shown to be within an area of lands benefitting from any Drainage District.	No
Flood Relief Schemes	N/A	There are no existing or proposed Flood Relief Schemes in the vicinity of the Plan Area	No
Former Local Area Plans	N/A	There are no former LAPs for the Plan Area.	No
Greater Dublin Strategic Drainage Study (GDSDS)	2005	The GDSDS describes foul and surface water drainage systems in Fingal. There is no record of drainage system failure / flooding at the Plan Area.	No
Ordnance Survey Ireland (OSI) Mapping	N/A	There is no indication of artificial impoundments (e.g., canals, reservoirs / dams) that would present a risk of flooding to the Plan Area.	No
Walkover Survey	N/A	A walkover survey was carried out by McCloy Consulting on 28th April 2021.	Yes – refer to Section 4.3.2

4.3.1 Topography

Existing ground levels within the Plan Area range from c. 42 to 24 meters Ordnance Datum (mOD), falling generally from west to east, as shown in Figure 4.4. There are no significant localised depressions within the Plan Area which was confirmed during a site walkover.

Lands at a higher elevation do exist in the vicinity so surface water runoff may be directed towards the Plan Area.

Figure 4.4: Plan Area Topography



4.3.2 Walkover Survey

A walkover survey of the Plan Area and adjacent lands was carried out by McCloy Consulting in April 2021. The purpose of the walkover survey was to ground truth desktop study findings, verify gaps in data, and identify the need for further surveying.

The Plan Area was noted to primarily comprise agricultural land and generally fall from north to south towards Flemington Lane. Observations relating to flooding and surface water drainage during the site visit are summarised as follows:

- No open watercourses or surface water channels were observed.
- Existing drainage was noted along Flemington Lane to the south.
- No evidence of flooding was found within the Plan Area.

4.4 Summary

In accordance with the OPW Guidelines, all available sources of flood risk information have been reviewed to identify any potential sources of flood risk to the Plan Area. The findings of the Stage 1 assessment indicate that lands within the Plan Area may be at risk of flooding. Therefore, a Stage 2 assessment has been carried out for the Plan Area and is presented in Section 5 of this SFRA.

5 STAGE 2 – INITIAL FLOOD RISK ASSESSMENT

5.1 Preamble

This section is intended to form a Stage 2 assessment of flood risk by confirming the sources of flooding that may be significant or possibly significant to the Plan Area, appraising the adequacy of existing flood risk information, and determining whether further assessment is required. The Stage 2 assessment is based on the flood risk information reviewed as part of the Stage 1 assessment presented in Section 4 of this SFRA.

5.2 Initial Assessment

Table 5.1 presents an initial assessment of sources of flooding that may be significant or possibly significant to the Plan Area and determines whether further assessment is required.

Table 5.1: Significance of Sources of Flooding to the Plan Area

Source of Flooding	Significant?	Reason	Assess Further?
Fluvial flooding	No	OSI / EPA mapping and datasets indicate that there are no open channels within the Plan Area. OPW flood mapping indicates that the Plan Area is not in an area affected by fluvial flooding.	No
Coastal flooding	No	The Plan Area is not in an area affected by coastal flooding.	No
Pluvial / surface water flooding	Possible	Topographical data indicates that the Plan Area may be affected by pluvial / surface water flooding.	Yes – refer to Section 5.3
Urban drainage flooding	No	Based on an initial evidence search, there is no indication of urban drainage flooding / sewer incapacity within the Plan Area or adjacent lands.	No
Groundwater flooding	No	GSI mapping indicates that the Plan Area is not in an area affected by groundwater flooding.	No
Flooding from artificial sources (e.g., impoundments)	No	A review of OSI mapping indicates that there are no impoundments, such as reservoirs or canals, in close proximity to or that drain towards the Plan Area.	No

5.3 Pluvial / Surface Water Flooding

5.3.1 Pluvial Flooding to the Site

Topographical data (as shown in Figure 4.4) indicates that the Plan Area may be affected by pluvial flooding.

Lands to the south, east, and west of the site are at a similar or lower elevation. Surface water runoff from these areas would therefore not flow towards the site. Runoff from the north of the site would tend to flow towards and through the site. Therefore, analysis of the pluvial flood risk at the site has been undertaken and is presented in Section 6.

5.3.2 Pluvial Flooding from the Site

With future development, the Plan Area will be subject to an increase in impermeable area (i.e., roof and hardstanding), meaning it has the potential to cause an increase in flood risk elsewhere if surface water discharge is not adequately managed.

Residual impact of surface water to future development and off-site receptors shall be mitigated through an effective surface water drainage network and surface water management.

5.3.3 Sustainable Drainage Strategy

An SDS has been prepared in conjunction with this SFRA, together forming an SWMP for the Plan Area. The purpose of the SDS is to outline a framework for the delivery of a drainage system that integrates multi-functional SuDS components within the Plan Area to manage water at or near the surface in a way that provides maximum water quantity, water quality, amenity, and biodiversity benefits. The SDS also includes a SuDS concept masterplan intended to inform 'plan making' (not outline and detailed drainage layouts).

Refer to the SDS portion of the SWMP for further details.

5.4 Summary

In accordance with the OPW Guidelines, an initial assessment of potential sources of flood risk to the Plan Area has been carried out. The findings of the Stage 2 assessment indicate that areas within the Plan Area may be affected by pluvial flooding. Therefore, a Stage 3 assessment has been carried out for the Plan Area and is presented in Section 6 of this SFRA.

6 STAGE 3 – DETAILED FLOOD RISK ASSESSMENT

6.1 Preamble

The Stage 2 assessment presented in Section 5 confirmed that the Plan Area is affected by pluvial flooding and that no other significant flood mechanisms are anticipated. In the absence of pluvial flood data, further assessment was deemed to be required.

Therefore, area-specific overland flow path and depression analysis was undertaken by McCloy Consulting to facilitate a better understanding of pluvial flood risk to the Plan Area. The results of this analysis are summarised in this section, which is intended to form a Stage 3 assessment.

6.2 Hydrology

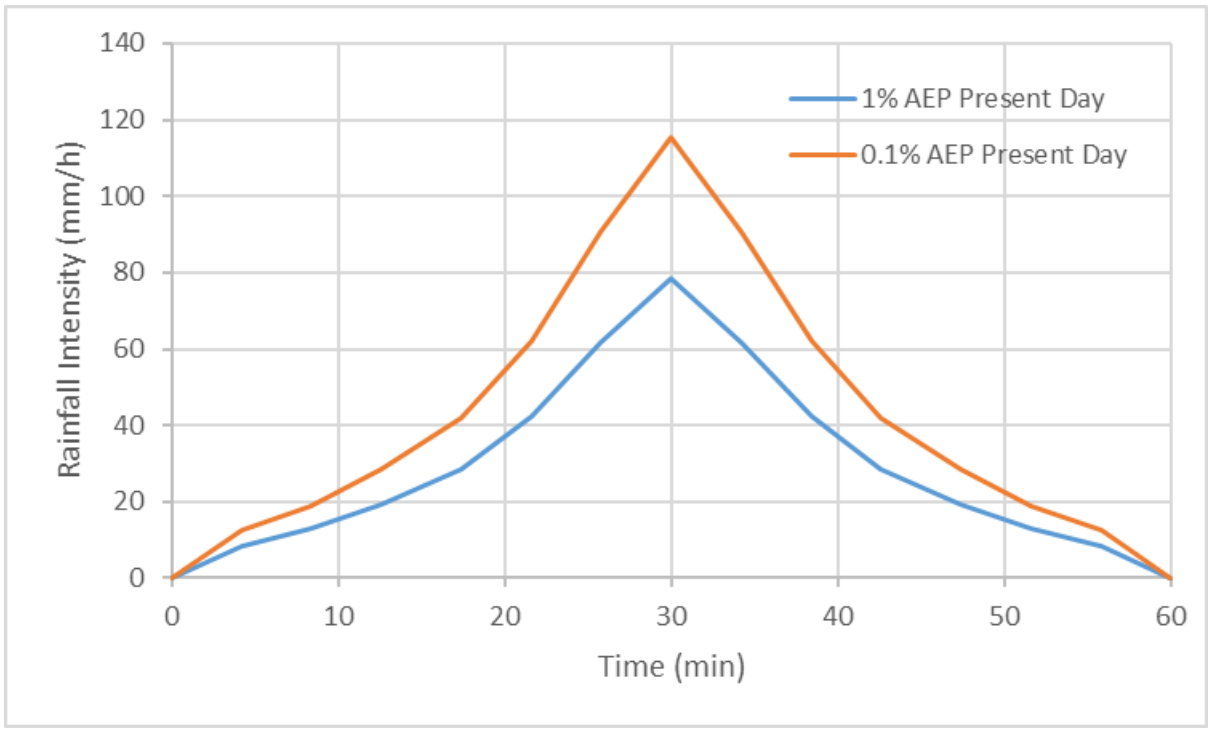
Rainfall has been derived from the OPW Flood Studies Update (FSU) Rainfall Depth Duration Frequency (DDF) module. Rainfall is calculated at the closest 2 km grid point located near Bridgefoot Road / Flemington Lane, approximately 580 m south-west of the site.

Rainfall profiles for the 1-, 3-, and 6-hour storm durations for the 1% AEP event have been calculated from the FSU Rainfall DDF module and converted from rainfall depth to intensity.

The FSU methodology does not extend to allow estimation of 0.1% AEP rainfall directly. Rainfall for the 1-, 3-, and 6-hour storm durations for the 0.1% AEP event were therefore estimated by plotting a range of total rainfall depths against the associated return periods up to the 0.4% AEP (i.e., 250-year) event. The rainfall curve for each storm duration was plotted on a logarithmic scale, and the 0.1% AEP total rainfall was estimated from the trendline equation.

Rainfall profiles for each storm duration for the 0.1% AEP event were then derived by scaling the total rainfall depth to the 1% AEP hyetograph. The 1-hour critical duration storm profiles for the 1% AEP and 0.1% AEP events are shown in Figure 6.1.

Figure 6.1: 1% AEP and 0.1% AEP (1 hour) Present Day Rainfall Profiles



The effect of climate change has been considered for the 1-hour critical duration storms for the 1% AEP and 0.1% AEP events. Allowances of 20% for the Mid-Range Future Scenario (MRFS) and 30% for the High-

End Future Scenario (HEFS), as set out in OPW guidance, were added to the present-day rainfall profiles. The resulting hyetographs are shown in Figure 6.2 and Figure 6.3.

Figure 6.2: 1% AEP (1 hour) Present Day and Climate Change Rainfall Profiles

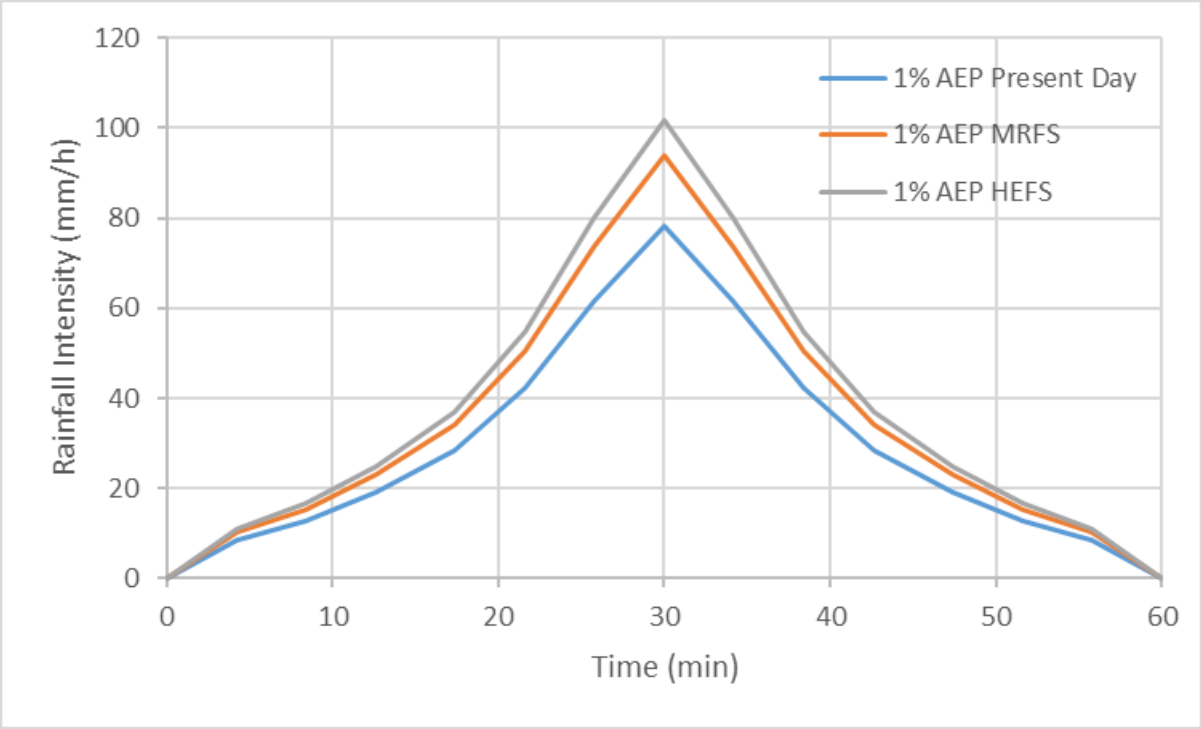
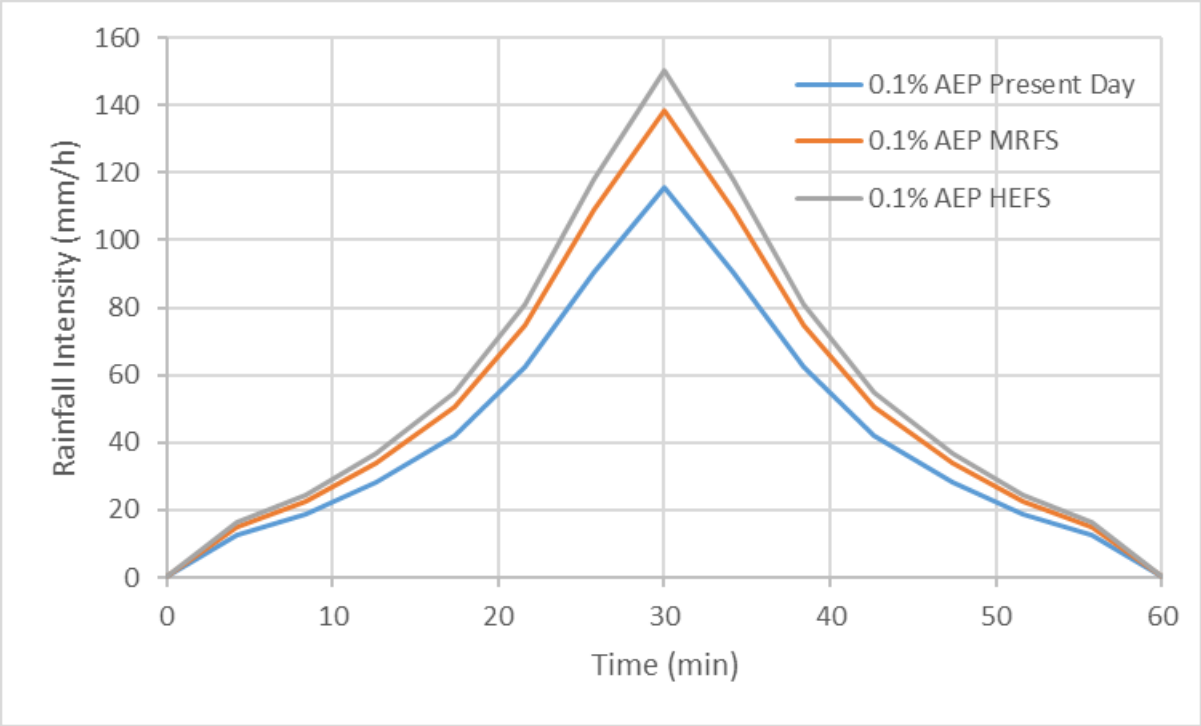


Figure 6.3: 0.1% AEP (1 hour) Present Day and Climate Change Rainfall Profiles



6.3 Overland Flow Path and Depression Analysis

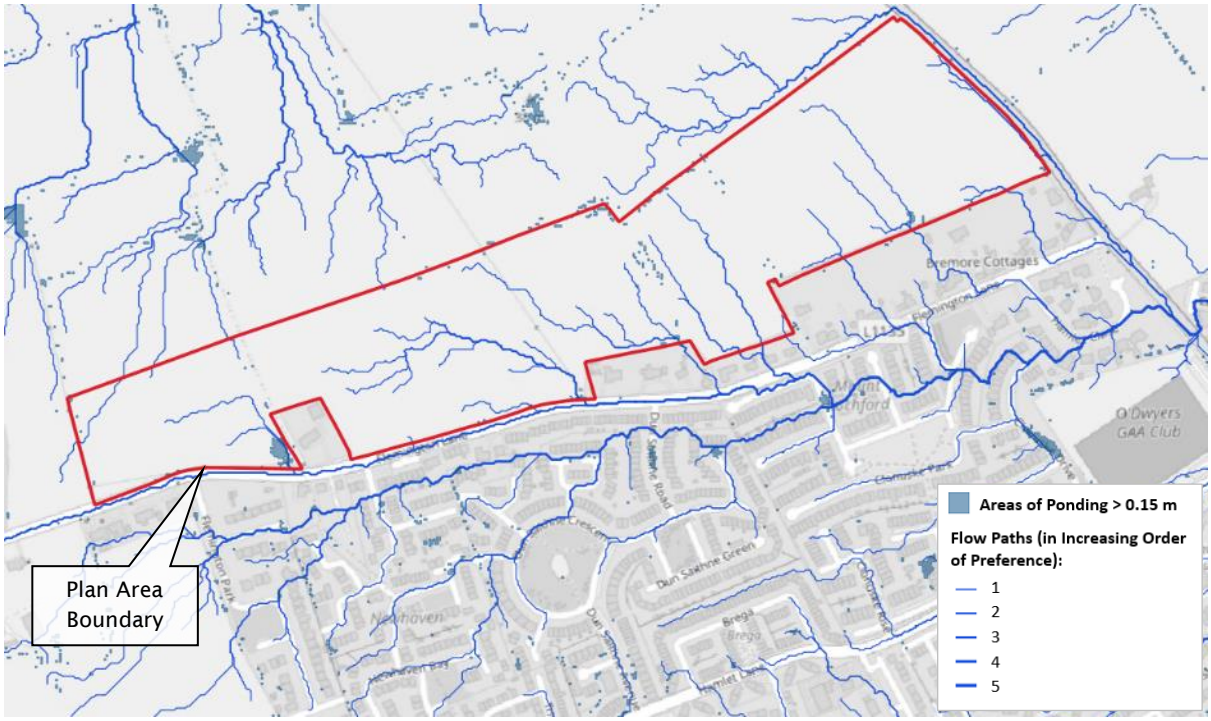
Pluvial overland flow path and ponding analysis was undertaken using GIS software. The algorithm for this analysis uses height data and a Rho-8 type "rolling ball" / Strahler Order hydrological analysis to determine the extents of catchment areas, key overland flow paths, and localised depressions where surface water is likely to pond.

The height data used for the analysis is based on Ordnance Survey Ireland (OSI) 2 m LiDAR licenced for use in this assessment. Roads and buildings were added to the LiDAR surface to ensure that important preferential flow paths and obstructions, respectively, were represented. Roads were lowered by 0.125 m and, in the absence of surveyed finished floor levels, building footprints were raised by 0.300 m per industry norm.

Key overland flow paths and areas of likely surface water ponding determined from the GIS analysis are shown in Figure 6.4.

Mitigation of residual risk of pluvial flooding shall be achieved through appropriate setting of Finished Floor Levels (FFLs) / Finished Ground Levels (FGLs) and through surface water drainage design as discussed in the SDS.

Figure 6.4: Key Overland Flow Paths and Areas of Likely Surface Water Ponding



7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary

This SFRA report has been prepared in accordance with the OPW Guidelines and provides a detailed assessment of all sources of flood risk within the Plan Area to assist Fingal CC in making informed strategic decisions in relation to the future development of the Plan Area.

In achieving the aims and objectives of the OPW Guidelines, Fingal CC should:

- Adopt a sequential approach to flood risk management, which aims to avoid flood risk where possible, substitute less vulnerable uses where avoidance is not possible, and mitigate and manage the risk where avoidance and substitution are not possible.
- Apply the Justification Test for development in Flood Zones.

It is noted that while the Plan Area is affected by pluvial flooding, no fluvial or coastal flood risk has been identified. Therefore, in line with the OPW Guidelines and Fingal SFRA, the Plan Area is wholly located in Flood Zone C and appropriate for development of any vulnerability classification.

A precautionary approach should also be applied to flood risk management to reflect uncertainties in available flood data, risk assessment techniques and climate change projections.

7.2 Recommendations

7.2.1 Design Levels

A key mechanism for providing flood protection and resilience is the setting of Finished Floor Levels (FFLs), Finished Ground Levels (FGLs), or flood defence levels with appropriate freeboard above the relevant design flood levels.

Freeboard is a safety margin to account for uncertainties in water-level prediction and / or structural performance. It is the difference between the FFL / FGL or flood defence and the adjacent design flood level. Freeboard is designed to account for uncertainty in hydrological predictions, wave action, modelling accuracy, topographical accuracy, and the quality of digital elevation models.

The Fingal SFRA sets out required design levels / freeboard for areas affected by fluvial and coastal flooding. As the site lies outside both the fluvial and coastal floodplain, these FFL / FGL requirements and associated freeboard do not apply.

Design levels within the site should be designed to be resilient to the residual risk of pluvial / surface water flooding.

7.2.2 Access and Egress

In accordance with the OPW Guidelines, access to and egress from any future development within the Plan Area should be within Flood Zone C (i.e., outside the 0.1% AEP fluvial / coastal floodplain).

7.2.3 Surface Water Management

Management of internal surface water runoff within the Plan Area (i.e. surface water from development) shall be managed in accordance with the Sustainable Drainage Strategy (SDS) component of the Surface Water Management Plan (SWMP), the outcomes of which are informed by this SFRA.

Appendix A

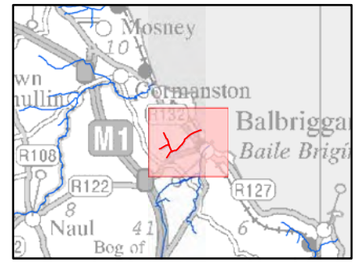
OPW / Fingal CC Flood Mapping

N

Tidal flooding may also occur within the area shown on this map. Please refer to the tidal flood extent map. Figure No. BNS/HPW/EXT/CURS/T/001

0.2 0.1 0 0.2
Kilometres

Location Plan :



EXTENT MAP

Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (>40m) (10% and 0.1% AEP)
- High Confidence (<20m) (1% AEP)
- Medium Confidence (<40m) (1% AEP)
- Low Confidence (>40m) (1% AEP)
- Estimate route of existing drain
- Node Point
- 21Ma237 Node label with level data (refer to table)
- 21Ma237 Node level with flow & level data (refer to table)

High confidence
Medium confidence
Low confidence
refer to table

USER NOTE :

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Clients :

Fingal County Council
Meath County Council
OPW

Project :
FEM FRAMS

Map : BALBRIGGAN NORTH STREAM MODEL
FLOOD EXTENT MAP

Map Type :	FLOOD EXTENT		
Source :	FLUVIAL FLOODING		
Map area :	HIGH PRIORITY WATERCOURSE		
Scenario :	CURRENT		
Figure By :	Mara Ruiz	Date :	8 August 2010
Checked By :	Sergio Herbón	Date :	8 August 2010
Approved By :	Clare Dewar	Date :	8 August 2010

Figure No. : BNS/HPW/EXT/CURS/001
Revision 0

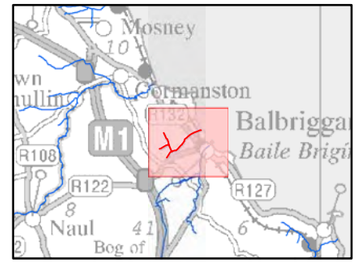
Drawing Scale : 1:10,000
Plot Scale : 1:1 @ A3

N

Fluvial flooding may also occur within the area shown on this map. Please refer to the fluvial flood extent map. Figure No. BNS/HPW/EXT/CURS/001

0.2 0.1 0 0.2
Kilometres

Location Plan :



EXTENT MAP

Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 0.5 % AEP Flood Extent (1 in 200 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (> 40m) (10% and 0.1% AEP)
- High Confidence (<20m) (0.5% AEP)
- Medium Confidence (<40m) (0.5% AEP)
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Clients :

Fingal County Council
Meath County Council
OPW

Project :
FEM FRAMS

Map : BALBRIGGAN NORTH STREAM MODEL
FLOOD EXTENT MAP

Map Type :	FLOOD EXTENT
Source :	TIDAL FLOODING
Map area :	HIGH PRIORITY WATERCOURSE
Scenario :	CURRENT

Figure By :	Mara Ruiz	Date : 17 January 2011
Checked By :	Sergio Herbón	Date : 17 January 2011
Approved By :	Clare Dewar	Date : 17 January 2011

Figure No. : BNS/HPW/EXT/CURS/T/001
Revision 1

Drawing Scale : 1:10,000
Plot Scale : 1:1 @ A3

717000 718000 719000 720000 721000 722000 723000

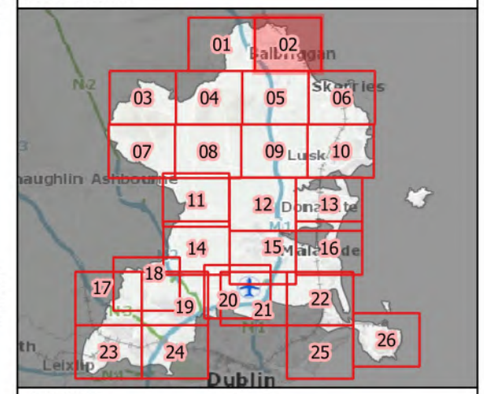
767000 766000 765000 764000 763000 762000

R132 R122 M1 Balbriggan Castlelands Fleminstown Gormanston Tobersool Drogheda Street Chapel Street Dublin Street Market Green Dublin Road Skerries Road R127

0 0.5 1 km

MAP SERIES	02 OF 26

KEY PLAN



LEGEND

- Fingal County Administrative Boundary
- Watercourses
- LAP & Masterplan Boundaries
- Flood Zone A
- Flood Zone B
- Defended Areas

REV:	NOTE:	
05	FOR INFORMATION	05/04/2023

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MAP:	FLOOD ZONE MAP	
FLOOD PROBABILITY:	FLUVIAL: 1% / 0.1%	COASTAL: 0.5% / 0.1%
SOURCE CRS:		ITM EPSG:2157
DRAWN BY:	DL	DATE: 05/04/2023
CHECKED BY:	PS	DATE: 05/04/2023
APPROVED BY:	DKS	DATE: 05/04/2023
DRAWING NUMBER:	M02127-06_FIG_FL102	
DRAWING SCALE:	1:20000 @ A3	

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MAPPING DISCLAIMER

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LIST OF FIGURES

APPENDICES

1 INTRODUCTION

1.1 Terms of Reference

This Sustainable Drainage Strategy (SDS) forms the second part of a Surface Water Management Plan (SWMP) commissioned by Fingal County Council (Fingal CC) to inform the Flemington Local Area Plan (LAP). The lands at Flemington are hereafter referred to as 'the Plan Area'.

1.2 Statement of Authority

This assessment and report have been prepared and reviewed by the following qualified professionals:

- Duncan Hartwick *BEng (Hons) BSc (Hons)* – Senior Engineer specialising in hydrology, flood risk assessment, hydraulic modelling, and SuDS design.
- Paul Singleton *BEng (Hons) MSc CEng MIEI* – Associate Director and Chartered Engineer specialising in flood risk assessment, hydrology, surface water management, and SuDS design, and a recognised industry professional providing training courses on these topics to the public and private sectors in Ireland and the UK.
- Kyle Somerville *BEng (Hons) CEng MIEI* – Director and Chartered Engineer specialising in flood risk assessment, hydrology, hydraulic modelling, surface water management, and SuDS design.

1.3 Purpose and Scope

The purpose of the SDS is to set out a framework for the delivery of Sustainable Drainage Systems (SuDS) to manage surface water within the Plan Area in a way that provides maximum water quantity, water quality, amenity, and biodiversity benefits.

The SDS is ultimately intended to inform 'plan making' not to define outline and detailed drainage layouts, which are to be prepared as part of SuDS strategies / plans in support of planning application(s) at a later stage.

Included with the SDS is a SuDS concept masterplan indicating the preferred approach for integrating multi-functional SuDS components within the Plan Area to control the quantity and quality of runoff and to create and sustain amenity and biodiversity space. While any development proposal(s) for the Plan Area should carefully consider the findings and recommendations of the SDS when developing outline and detailed drainage layouts, the SuDS concept masterplan is not fixed, and there is flexibility in terms of how the final layout is defined.

1.4 Applicable Guidance

The SDS aims to ensure relevant policies / objectives from the 'Fingal Development Plan 2023-2029' (Fingal CDP) and other guidance is followed. SuDS are referred to extensively throughout the Fingal CDP with mentions in the following chapters:

- Chapter 2: Planning for Growth / Core Strategy / Settlement Strategy
- Chapter 4: Community Infrastructure and Open Space
- Chapter 5: Climate Action
- Chapter 6: Connectivity and Movement
- Chapter 9: Green Infrastructure and Natural Heritage
- Chapter 11: Infrastructure and Utilities
- Chapter 14: Development Management Standards

The 'Strategic Flood Risk Assessment for the Fingal Development Plan 2023-2029' (Fingal SFRA) states that any surface water drainage design should be compliant with the following to ensure drainage from the site is managed sustainably:

- Department of Housing, Local Government and Heritage (DHLGH) Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas; Water Sensitive Urban Design Best Practice Interim Guidance Document

- Fingal CC Green / Blue Infrastructure for Development Guidance Note (2021)
- CIRIA SuDS Manual C753 (2015)
- Greater Dublin Regional Code of Practice for Drainage Works (2012)
- Greater Dublin Strategic Drainage Study (GDSDS) (2005)

It is noted that updates to the above documents and / or new published documents during the lifetime of the Fingal SFRA are to be implemented as part of future schemes where appropriate.

2 PLAN AREA INFORMATION

2.1 Location and Boundary

Refer to Section 2.1 of the Strategic Flood Risk Assessment (SFRA) portion of the SWMP.

2.2 Existing Land Use

Refer to Section 2.2 of the SFRA.

2.3 Zoning Objectives and Proposed Development

Refer to Section 2.3 of the SFRA for zoning objectives for the Plan Area based on the Fingal CDP. The Plan Area land zoning is 'Residential Area'.

In line with the zoning objectives, development proposals for the Plan Area will include the construction of residential development and associated infrastructure. Development at the site is likely to lead to an increase to the extent of impermeable areas within the Plan Area, resulting in an increased rate and volume of runoff when compared to the existing scenario.

2.4 Topography

Refer to Section 2.4 of the SFRA.

2.5 Water Environment

Refer to Section 2.5 of the SFRA.

2.6 Geology and Hydrogeology

Geological Survey of Ireland (GSI) mapping indicates the following in relation to the geology and hydrogeology of the Plan Area:

- Subsoil geology comprises primarily Irish Sea Till derived from Lower Palaeozoic sandstones and shales.
- The subsoil underlying the Plan Area has low permeability and low recharge capacity.
- Bedrock geology primarily comprises the Belcamp Formation (andesite, pillow breccia, mudstone, tuff).
- There are no bedrock outcrops within the Plan Area.
- The Plan Area is within the Balbriggan groundwater body (classified as productive fissured bedrock).
- The Plan Area is not within any Public Water Supply / Source Protection Zone.
- The Plan Area is noted as being within areas both low and moderate risk for groundwater to be contaminated by human activities.

No site investigation / infiltration testing has been conducted for the Plan Area.

2.7 Existing Utilities

No record of existing underground utilities has been found or made available as part of this SDS. Any existing utilities found at a later stage, which cannot be relocated or abandoned, will need to be considered prior to progressing outline and detailed design (including SuDS design) for the Plan Area.

2.8 Plan Area Constraints

Table 2-1 summarises the constraints / parameters that will inform the development of the SDS.

Table 2-1 Plan Area Constraints / Parameters

Potential Constraint	Comment	Confidence (L / M / H)	Constraint on SuDS Design?
Flood Risk	Flood risk at the Plan Area is assessed in the SFRA.	H	GIS analysis presented in the SFRA has determined existing pluvial flow routes / extents within the Plan Area, which should be considered at all stages of design.
Drainage Infrastructure	No existing drainage, including open surface channels and underground systems, were found as part of this assessment.	M	A detailed SuDS Strategy will be required to ensure that any existing drainage function is preserved.
Underground Utilities	No record of existing underground utilities has been found or made available as part of this SDS.	N/A	CAT scan / trial pits will be required, the extent of which will depend on options taken to detailed design.
Topography	Based on topographical survey data and LiDAR height data, existing ground levels range from c. 42 mOD to 24 mOD, generally falling from west to east.	H	The existing topography will influence the existing flow routes at the Plan Area and therefore the preferred management train.
Existing & Proposed Land Use	The Plan Area currently comprises primarily agricultural land. The Plan Area zoning is 'Residential Area'.	M	There is currently no proposed development for the Plan Area. SuDS components and design should be compatible with the design and landscape characteristics associated with residential development.
Size of Plan Area	The Plan Area has an area of c. 17.4 ha.	H	N/A
Ground Contamination	No site investigation / infiltration testing has been conducted for the Plan Area.	L	Ground contamination issues at the Plan Area are unknown. Site investigation is required, the extent of which will depend on options taken to detailed design.

Potential Constraint	Comment	Confidence (L / M / H)	Constraint on SuDS Design?
Infiltration Potential	No site investigation / infiltration testing has been conducted at the Plan Area.	L	Winter rainfall acceptance potential (WRAP) class is 2 (i.e., relatively free draining) whereas GSI mapping indicates low permeability subsoil. Observations and the lack of open channels watercourses indicate that lands within the Plan Area are likely be suitable for infiltration. Site investigation / infiltration testing is required, the extent of which will depend on options taken to detailed design.
Archaeological & Architectural Heritage	No archaeological or architectural heritage monuments / sites have been identified within the Plan Area.	H	There is no constraint to SuDS design as a result of archaeological or architectural heritage.
Local Authority Requirements	Fingal CC has identified that it does not currently take in charge permeable pavement.	H	Where SuDS infrastructure is not taken in charge, these assets (if provided) would need to be managed by a maintenance company.

3 SuDS STRATEGY

The SDS outlines the preferred approach for the management of rainfall runoff within the development to ensure no increase in flood risk to any development within the Plan Area or elsewhere with delivery of wider water quality, amenity, and biodiversity benefits.

The approach to the SDS is as per the guidance from the CIRIA SuDS Manual, which is summarised as follows:

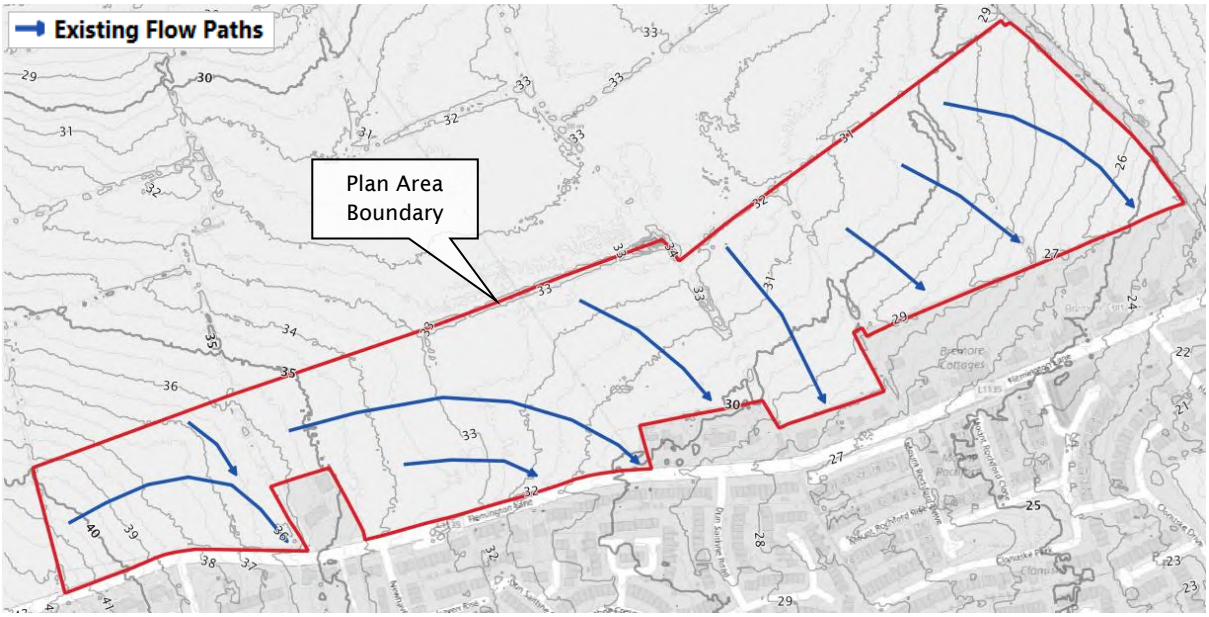
- Identify existing and modified flow routes.
- Identify suitable mechanism of surface water discharge for Plan Area drainage.
- Allocate a management train and appropriate number of subcatchments to provide the collection, treatment, storage, and conveyance of runoff across the Plan Area.
- Identify a range of SuDS components which are in keeping with the proposed landscape character and other objectives for the Plan Area. At this stage, any definition of SuDS features for specific areas of the Plan Area should not be treated as 'fixed' aspects of the design.

3.1 Flow Route Analysis

3.1.1 Existing Flow Routes

Flow route analysis was carried out to determine existing (i.e., pre-development) runoff characteristics at the Plan Area. There are a number of existing flow routes that enter and exit the Plan Area, as shown in Figure 3-1. Detailed SuDS design for the Plan Area will need to consider how flows along these flow routes will be managed.

Figure 3-1: Existing Flow Route Analysis



3.1.2 Modified Flow Routes

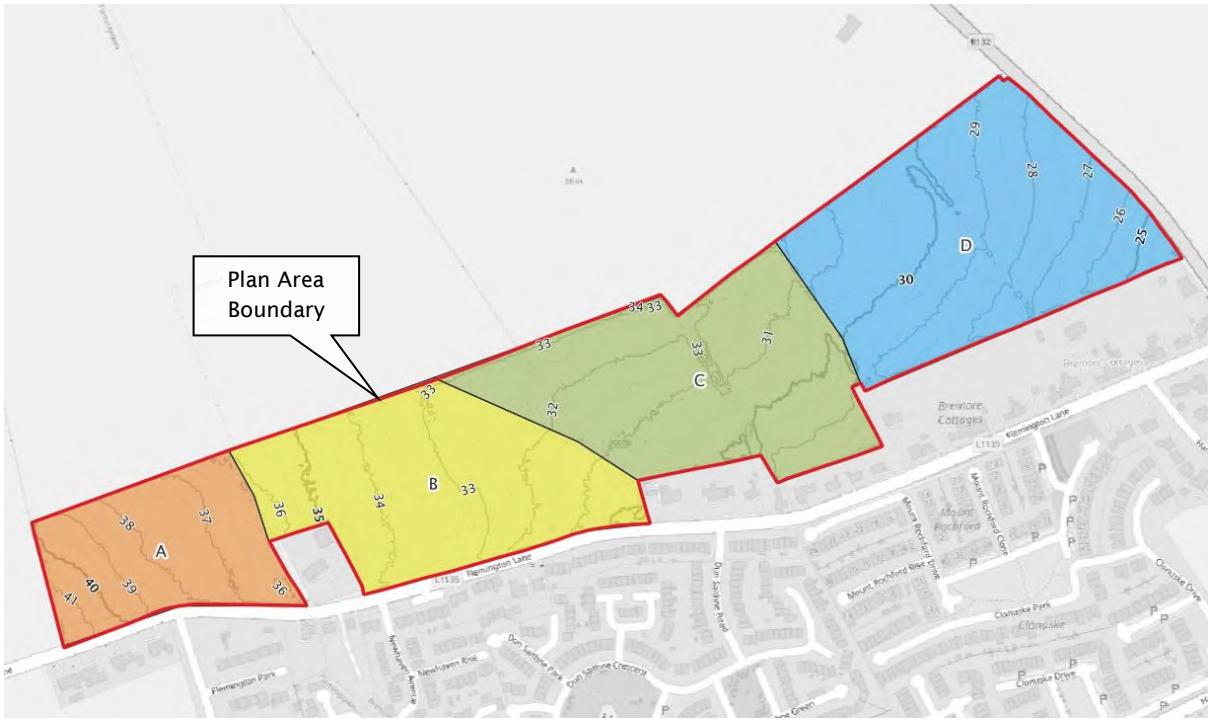
Modified flow route analysis identifies how the existing / original flow routes are modified by proposed development and as such, creates a framework for the selection of suitable SuDS components. Due to the absence of proposals for the Plan Area, it is not possible to undertake a modified flow route analysis at this stage. This should be carried out at outline / detailed design stage.

As discussed in Table 2-1, there is likely to be good infiltration potential at the Plan Area. However, no site investigation / infiltration testing data is currently available. Assessment of modified flow routes at a future stage should consider the potential for infiltration as well as surface water runoff / discharge.

3.2 Subcatchments

Figure 3-2 demonstrates how runoff from the Plan Area will be managed in subcatchments using natural overland conveyance. Flows will be conveyed from one subcatchment to the next along one or more management trains, following the modified flow routes.

Figure 3-2: Subcatchments Within the Plan Area



3.3 Drainage Hierarchy

The way runoff is dealt with within the Plan Area should adhere to the following drainage hierarchy (in order of decreasing preference):

i. Reuse – Where opportunities arise for rainfall harvesting within proposed development plans, these should be maximised.
ii. Infiltration – Infiltration could be utilised subject to outcome of site investigation.
iii. Watercourse – There are no natural watercourses in the vicinity of the Plan Area.
iv. Surface Water Sewer – No surface water drainage records have been made available to inform this assessment.
v. Combined Sewer – N/A.

In line with the discharge hierarchy, where the outcome of a site investigation indicates sufficient permeability, the preferred discharge route from the Plan Area will be via infiltration of runoff into the ground.

3.4 Water Quantity

Sufficient attenuation is to be provided to ensure no unpredictable flooding occurs within the Plan Area, future development is protected, and no increase in flood risk elsewhere. Flows can be temporarily stored at points of collection (i.e., source controls) along the conveyance route and at the points of proposed storage.

The SDS identifies the potential for infiltration, subject to site investigation / infiltration testing. Where infiltration is deemed suitable through site investigation, sufficient storage will be provided to accommodate up to the 1% AEP rainfall runoff with allowance for climate change. In this scenario, discharge from the Plan Area would only occur in the event of the design horizon being exceeded.

Where infiltration is deemed unsuitable through site investigation, flows will be attenuated throughout the Plan Area and final flows attenuated to the rates prescribed in Table 3-1.

3.4.1 Climate Change

The future impacts of climate change on rainfall should be accounted for in the design of a drainage scheme. Requirements for climate change allowances are set out in the OPW's 'Climate Change Sectoral Adaptation Plan' published in 2019, which recommends a 20% uplift in extreme rainfall depths for the Mid-Range Future Scenario (MRFS) and a 30% uplift for the High-End Future Scenario (HEFS).

In line with current Fingal CDP guidance, the MRFS allowance is applied for climate change calculations carried out for this SDS.

3.4.2 Controlled Flow Rates

The flow rates shown in Table 3-1 are in accordance with the requirements of the GDSDS and Fingal CC for restriction of post-development runoff to greenfield rates. They provide guidance on the extent to which flows should be controlled from any proposed development within the Plan Area if infiltration is deemed not feasible / not possible.

The greenfield rates were calculated using the Flood Studies Supplementary Report (FSSR) methodology with catchment-specific characteristics, including a winter rainfall acceptance potential (WRAP) class 2 and standard annual average rainfall (SAAR) depth of 743 mm.

Table 3-1: Attenuation Flow Rates

Return Period	Greenfield Attenuation Rate * (l/s/ha)	Controlled Attenuation Rate ** (l/s/ha)
100% AEP (1 in 1 year)	1.41	2
Qbar (1 in 2.33 year)	1.65	2
3.33% AEP (1 in 30 year)	2.73	2
1% AEP (1 in 100 year)	3.25	2

* Long Term Storage provided (i.e., volume is controlled to greenfield volumes) – flows attenuated to respective greenfield rate
** Long Term Storage not provided (i.e., volume is not controlled to greenfield volumes) – all return periods attenuated to Qbar or 2 l/s/ha (whichever is greater)

3.4.3 Storage of Runoff and Discharge Location

Runoff should be attenuated within each subcatchment of the Plan Area (refer to Figure 3-2). SuDS components for collection, storage, and conveyance of flow should be selected based on their suitability for the proposed development design, with consideration given to relevant constraints.

Attenuation storage will be sized for the 1% AEP critical rainfall event with allowance for climate change. In the absence of site investigation data, the attenuation storage volumes shown in Table 3-2 are indicative only and do not include an allowance for infiltration.

Table 3-2: Indicative Attenuation Storage Volumes

Return Period	Indicative Attenuation Volume * (m^3 storage / m^2 development)
100% AEP (1 in 1 year)	0.019
3.33% AEP (1 in 30 year)	0.050
1% AEP (1 in 100 year) + CC	0.084

* All return periods attenuated to Qbar or 2 l/s/ha (whichever is greater) – no allowance made for infiltration

Where discharge is via infiltration, flows will be discharged to the ground at the respective infiltration locations. The storage volumes for infiltration features are likely to result in different storage volumes than those provided for the guidance above.

3.4.4 Designing for Exceedance

Plan Area levels and landscaping should be designed to route exceedance flows away from buildings. Overland flow routes should be managed in a safe manner using the drainage systems, roads, and public spaces to convey and control floodwater during extreme events. Exceedance outflows from the Plan Area will be designed to mimic the existing flow patterns and ensure that there is no increased risk to others outside the Plan Area.

3.5 Water Quality

3.5.1 Water Quality Requirements

Proposals for the Plan Area are likely to comprise residential development and therefore considered to be medium risk in relation to water quality. Treatment requirements are as follows:

- Roof only runoff – removal of solids.
- Roads used for vehicular movement – 1-2 stages of treatment dependant on SuDS component selected.

Design of individual SuDS components for water quality treatment should comply with the criteria set out in the CIRIA SuDS Manual (refer to the relevant chapter for each SuDS component).

Where site investigation / infiltration testing indicate that existing ground conditions have sufficient capacity for infiltration, groundwater risk screening (as set out in Chapter 26, Tables 26.5 and 26.6 of the CIRIA SuDS Manual) should be undertaken to demonstrate manageable risk.

If infiltration is deemed suitable or if attenuation is proposed with a positive discharge point from the Plan Area, the 'simple index approach' is to be used to validate design for water quality treatment (as set out in Section 26.7 of the CIRIA SuDS Manual). Application of treatment indices applied in the simple index approach will depend on whether the proposed system is attenuation or infiltration (refer to Sections 26.3 and 26.4 of the CIRIA SuDS Manual, respectively).

Sufficient treatment is to be provided prior to flows being attenuated in any SuDS areas being promoted for amenity / biodiversity function.

3.5.2 Construction Management

A Construction Management Plan will be required to outline how surface water runoff will be managed during construction and to ensure appropriate mitigation is in place to minimise risk of flooding and pollution during construction.

3.6 Amenity

Amenity focuses on the usefulness and aesthetic elements of SuDS design associated with features 'at or near the surface' and considers both multi-functionality and visual quality.

The following are highlighted for consideration as part of the development of the SuDS design:

- SuDS should be 'legible' (i.e., understandable in terms of their operation to people using the area and to maintenance personnel).
- The visual character of the SuDS component will enhance the development.
- Spaces and connecting routes are multi-functional and can be used when not providing a SuDS function for surface water management.
- The design shall ensure the proposed development is generally accessible and 'safe by design'.
- Consideration should be given to information boarding to inform Plan Area users of the benefits of the SuDS scheme and also give guidance to the potential of temporary or permanent presence of surface water storage.

3.7 Biodiversity

Biodiversity must be considered in the design at a catchment scale to create sympathetic blue-green infrastructure and at local scale to provide habitat and connectivity linkages within and around the Plan Area.

The following are highlighted for consideration as part of the development of the SuDS design:

- Ensure water quality within the water environment by following the steps of the simple index approach (as set out in Chapter 26, Box 26.2 of the CIRIA SuDS Manual).
- Demonstrate ecological design and the creation of habitats within the SuDS corridor.
- Keep water at or near the surface as it flows through the SuDS management train towards to wider landscape to ensure habitat connectivity.
- Confirm management practices to enhance habitat development during maintenance.

3.8 SuDS Components Audit

Table 3-3 presents a comprehensive audit of potential SuDS components deemed suitable based on the characteristics of the Plan Area. It is noted that this is not an exhaustive list, and further information relating to the Plan Area is likely to result in refinement. It is also noted that the Plan Area is likely to be reasonably free draining, meaning any SuDS components that incorporate permanent water (i.e., ponds and wetlands) may need to be lined to ensure they appear and function as intended.

3.9 SuDS Concept Masterplan

A SuDS concept masterplan indicating the preferred approach for integrating multi-functional SuDS components within the Plan Area in line with the above principles / criteria is included in Appendix A.

While any development proposal(s) for the Plan Area should carefully consider the findings and recommendations of this SDS when developing outline and detailed drainage layouts, the SuDS concept masterplan is not fixed, and there is flexibility in terms of how the final layout is defined.

Table 3-3: SuDS Component Audit

SuDS Component	Description	Suitable?	Rationale
Green / Blue Roofs	Green / blue roofs are areas of living vegetation installed on the top of buildings.	Possible	Proposed roofs have potential for green / blue roof solutions to reduce runoff, attenuate peak flows, and promote biodiversity. This would satisfy objectives of the Fingal CDP, which encourage the use of green roofs. It is noted that the use of green roofs may be influenced by the required landscape character for the Plan Area (e.g., residential roofs are generally pitched and as such, unsuitable for green / blue roofs).
Infiltration Systems	Infiltration systems allow surface water runoff to infiltrate and filter through to the sublayer layer before returning to the water table.	Possible	Based on the soil WRAP class and Plan Area observations, discharge via infiltration could be suitable subject to site investigation / infiltration testing. In line with the drainage hierarchy, infiltration should be prioritised over discharge to surface water bodies or sewers where possible.
Filter Strips	A strip of vegetation being an impermeable surface and an infiltration SuDS component.	Yes	There is potential to incorporate filter strips into development proposals to collect and treat surface water runoff.
Filter Drains	Filter drains, also known as French drains, are open trenches filled with stones.	Yes	There is potential to incorporate filter drains into development proposals to collect and treat surface water runoff.
Swales	Swales are shallow, flat-bottomed vegetated channels that collect, treat, convey, and store runoff.	Yes	Swales could be suitable to convey flows between different SuDS components and connect separate areas of green space.
Bioretention Systems & Rain Planters	Bioretention systems are shallow landscaped depressions containing engineered soils and vegetation, used to reduce runoff rates and volumes and to treat pollution. Rain planters are a type of raised bioretention system.	Yes	There is potential to incorporate bioretention systems and rain planters into development proposals to collect and attenuate roof and road runoff, treat surface water, and provide amenity and biodiversity benefits.

SuDS Component	Description	Suitable?	Rationale
Trees & Tree Pits	Trees and tree pits attenuate surface water runoff using the void space in each tree's root zone.	Yes	There is potential to incorporate trees and tree pits into development proposals.
Permeable Pavements	Permeable pavements allow rainwater to infiltrate through the surface into underlying structural layers where it is temporarily stored before infiltrating into the ground or being discharged downstream.	Possible	New roads and hardstanding areas will inevitably be provided as part of development proposals and, as such, there is scope to include permeable pavements. Fingal CC do not currently take in charge permeable paving. This requires consideration in terms of maintenance.
Rainwater Harvesting	Rainwater harvesting involves the collection and reuse of rainwater runoff from roofs.	Yes	Rainwater harvesting could be used to reduce surface water runoff and demand on potable water supplies. While it is unlikely to yield sufficient decreases in runoff rates to satisfy the requirements of the drainage strategy, it may be considered at the discretion of clients / developers. This would satisfy objectives of the Fingal CDP, which require new residential developments to use water butts and include the provision of infrastructure for rainwater harvesting where feasible and cost-effective.
Attenuation Tanks	Attenuation tanks are used to provide below-ground storage for before infiltrating into the ground or controlled release or use.	Possible	Objectives IUO11 and DMSO203 of the Fingal CDP state that "*tanked systems, whether concrete or plastic, are the least favoured means for surface water management and shall only be used when green solutions have proven not feasible*". Below-ground storage tanks should therefore only be used as a last resort where it has been demonstrated that other green infrastructure / SuDS measures are not feasible. Preference should be given to above-ground attenuation SuDS components to maximise benefits for water quality, amenity, and biodiversity and to satisfy the objectives set out in the Fingal CDP. This SDS has found no reason why above-ground SuDS components would not be feasible. It is noted that removal of silt ingress from attenuation tanks is a significant maintenance risk due to the lack of direct accessibility associated with below-ground features.
Detention Basins	Detention basins are landscaped depressions that are normally dry except during and immediately after rainfall events.	Yes	There is potential to incorporate detention basins into development proposals to attenuate flows, reduce runoff rates, and improve water quality prior to discharge. They can be multi-functional, doubling as recreation / public open space. This would satisfy objectives of the Fingal CDP, which encourage the incorporation of SuDS into all parts of a development.

SuDS Component	Description	Suitable?	Rationale
Ponds & Wetlands	Ponds and wetlands are features with a permanent pool of water that provide attenuation and treatment of surface water runoff.	Yes	There is potential to incorporate ponds and wetlands into development proposals in line with Fingal CDP objectives. Ponds with a permanent water level would provide amenity and biodiversity benefits within areas of open green space and can be designed to also provide a surface water storage and treatment benefit.

4 SUMMARY AND RECOMMENDATIONS

4.1 Summary

This SDS outlines the approach and criteria that should be followed when developing a SuDS design as part of any future development proposals for the Plan Area. The report includes design considerations to ensure quantity, quality, amenity, and biodiversity benefits. It also highlights existing flow routes and subcatchments within the Plan Area.

The SuDS approach outlined in this document should be developed through outline and detailed design in parallel with development and finalisation of future proposed development layouts.

A SuDS concept masterplan indicating the preferred approach for integrating multi-functional SuDS components within the Plan Area is included in Appendix A.

4.2 Recommendations

In addition to the general design criteria outlined in this SDS, the following recommendations are made for future SuDS strategies / plans for the Plan Area.

- The Plan Area has been identified as having potential for infiltration subject to site investigation and infiltration testing. Where infiltration is not feasible, provision of attenuation storage with positive discharge outlet will be required.
- Fingal CC will be required to be satisfied through demonstration (i.e., site investigation and risk screening / assessment) that there is sufficient capacity within the Plan Area geology to infiltrate and that the risk to receiving groundwater can be suitably managed.
- Future proposed development layout designs to consider the existing flow route analysis and be undertaken in conjunction with the SuDS design to facilitate consideration of modified flow routes.
- SuDS strategies / plans shall provide a management train through definition of subcatchments to maximise treatment and storage capacity.
- Application of greenfield runoff rate, dependent on adequate provision of 'long term storage / losses' is to be agreed with Fingal CC.
- The developed SuDS design should demonstrate that there is no increased flood risk to others, including residual risk from exceedance flow paths.
- Ownership and maintenance obligations for surface water drainage features should be established, and provision should be made by the relevant party for preventative inspection and maintenance.
- A Construction Management Plan will be required to ensure appropriate mitigation is in place to minimise risk of flooding and pollution during construction.

Appendix A

SuDS Concept Masterplan

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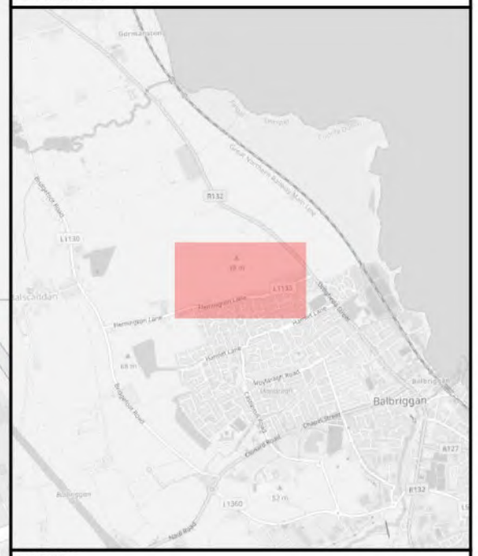
OVERVIEW



LEGEND

PLAN AREA BOUNDARY

SuDS CONCEPT COMPONENTS

CONVEYANCE

STORAGE

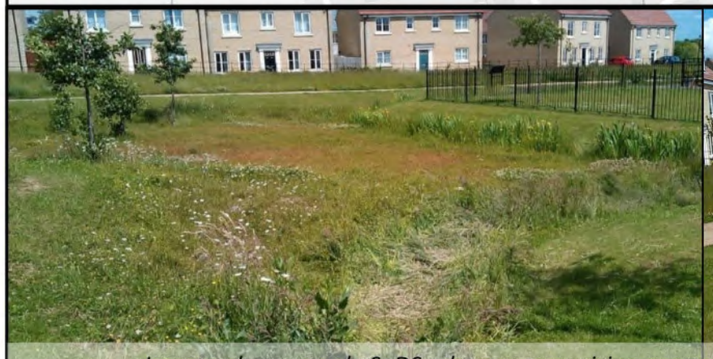
SUBCATCHMENTS

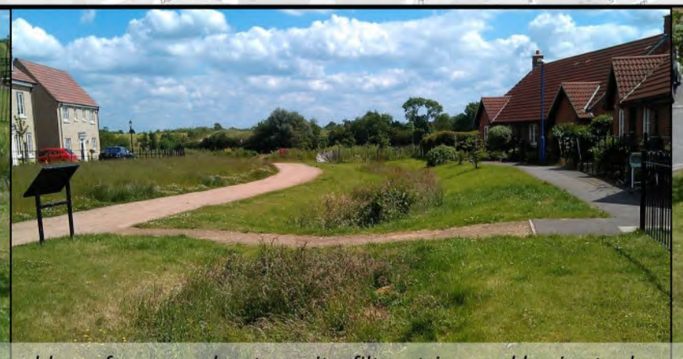
A

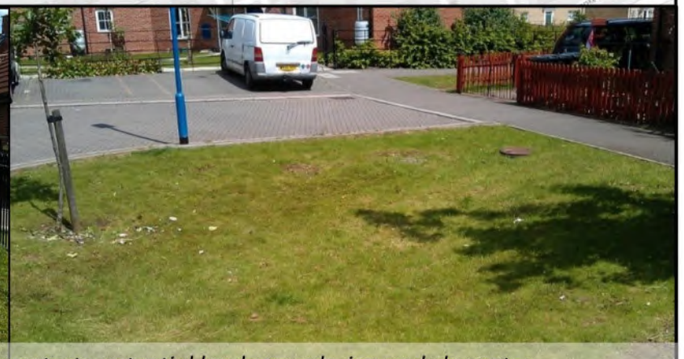
B

C

D







Images show sample SuDS schemes comprising permeable surfaces, swales, tree pits, filter strips, and basins to demonstrate potential landscape design and character.
SuDS components appropriate for proposed development of the Plan Area are to be decided at outline / detailed design stage.

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FLEMINGTON SuDS CONCEPT MASTERPLAN			
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DH	PS	02	06/11/2024

Comhairle Contae Fhine Gall
Fingal County Council