Comhairle Cathrach Bhaile Átha Cliath
Dublin City Council

Comhairle Contae Átha Cliath Theas
South Dublin County Council

CITY EDGE PROJECT

Strategic Flood Risk Assessment Report

April 2022

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DUBLIN CITY COUNCIL AND SOUTH DUBLIN COUNTY COUNCIL

CITY EDGE PROJECT

STRATEGIC FLOOD RISK ASSESSMENT REPORT

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April 2022

PROJECT NO. 20849					
Revision	**Reason for Revision**	**Prepared by**	**Reviewed by**	**Approved by**	**Issue Date**
-	Draft	O Ari	B Dunphy	C Duignan	26/08/2021
A	Draft following receipt of client comments	O Ari	B Dunphy	C Duignan	08/09/2021
B	Client comments	O Ari	B Dunphy	C Duignan	09/09/2021
C	Client comments	O Ari	B Dunphy	C Duignan	10/09/2021
D	Update for Strategic Framework Language	O Ari	B Dunphy	C Duignan	16/02/2022
E	Update for client comments	O Ari	B Dunphy	C Duignan	05/04/2022

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1 INTRODUCTION

1.1 Overview

This report outlines the findings of the Strategic Flood Risk Assessment (SFRA) for the City Edge Strategic Framework also known as **City Edge Project**.

The vision of the City Edge Project is to support the long-term, resilient growth of the Dublin region by making the most of the City Edge lands. Create a major new Urban Quarter on the edge of Dublin City, providing much needed new homes and employment space for the city, whilst ensuring the area's rich industrial history can continue to play an important role into the future. Five new neighbourhood, based on 15-minute city principles, will celebrate the area's existing qualities such as the Grand Canal, the River Camac and Lansdowne Valley Park. Whilst a network of new biodiversity rich parks, green and blueways, public transport, local high streets, community facilities and energy networks will help to meet our shared climate challenges.

The objectives are defined as:

- **Homes** – Accommodate a mixed and balanced community of between 75,000 and 85,000 new people with a choice of different housing types, tenures and sizes.
- **Community** – Support the needs of intergenerational communities through the timely provision of community, educational, health and social facilities.
- **Economy -** Create a resilient and diverse employment offer with scope for between 65,000 and 75,000 jobs.
- **Movement** – Ensure Transport Oriented Development by focussing new mixed-use and compact urban development on enhanced active travel and public transport corridors.
- **Natural Infrastructure** – Target 50% green cover to meet the needs of the future population while promoting a reintroduction of biodiversity and combatting climate change impacts such as flood risk.
- **Sustainability** – Fast track to zero carbon and zero waste to help address climate change and promote sustainable communities through the 15-minute city principle.
- **Character** – Integrate the renewal of the City Edge lands with existing residential communities by supporting good place making within the five local neighbourhoods and by celebrating local distinctiveness and ensuring climate resilient design.

- **Delivery** – Ensure a coordinated approach to the funding and delivery of infrastructure and utilities so that land can be developed in a timely and coherent manner that realises the City Edge Vision.

1.2 Project Status

The studies already prepared include a Baseline Analysis and Emerging Preferred Scenario. The project team has drafted a Strategic Framework and this will be followed by a Statutory Plan. These are all explained in more detail below;

Baseline Study

A Baseline Analysis was carried out for the project area to establish the characteristics of the area as it is currently. This examined areas including community, housing, employment, economy, transport, infrastructure, historical and archaeological features and environmental aspects. It also included a review of national, regional and local planning policy documents. Engagement with landowners was also carried out and a desktop survey of utilities and contaminated lands was undertaken.

Emerging Preferred Scenario

To determine a preferred direction for the project and identify an Emerging Preferred Scenario, three high level scenarios were assessed against the emerging objectives and vision for the City Edge Project Study Area as well as key constraints and opportunities identified in the Baseline Study. Elements from each of the three scenarios were evaluated against various criteria. Those elements that performed the best were combined, to produce the Emerging Preferred Scenario. This comprises a mix of residential-led development with significant employment, based around the creation of a number of development nodes of different character. These character areas include a major urban centre; local centres with high street activity; clusters of urban-industry & workspaces; and areas for housing and workspace.

Public Consultation

In the interests of engaging with stakeholders and informing the process of developing a Strategic Framework for the City Edge Project, non-statutory public consultation was held over a four-week period in September and October 2021. People were asked for their views on the City Edge Project including the Baseline Study, Emerging Preferred Scenario and Environmental Reports which included a SFRA. Several online events were held during the public consultation period including two public presentations with question-and-answer sessions and an international conference event held over two mornings during which guest speakers related their experience with international regeneration

projects and what lessons could be learnt for City Edge. A total of 106 submissions were received from residents, business and landowners, interest groups, state agencies and service providers, etc. and a summary of the issues raised and responses to these is included in a Chief Executive's Report considered at the December Council meetings of both local authorities – South Dublin County Council and Dublin City Council. There was a high level of engagement with the online events and widespread media coverage across all platforms including print, radio, television and online.

Strategic Framework

At present, the two local authorities along with a team of consultants, have gone through the process of drafting a Strategic Framework in tandem with this SFRA as well as a Surface Water Management Plan (SWMP) and Strategic Environmental Screening (SEA) Report. The Strategic Framework will inform a Statutory Plan and sets out a direction of travel in relation to housing, community, economy, movement, natural infrastructure, utilities, and character areas etc. The Framework is set out through a series of layers that together form a strategic whole. In order to set out the spatial construct of the Framework, a series of core components have been identified, which provide the skeleton that's needed to unlock the full potential of the study area. These would typically not be deliverable by individual landowners but are key in helping to create the place. The exact nature of these core components may evolve in parallel with further detailed investigations into the Framework in later Phases but represent the key infrastructure that can support and catalyse growth. This SFRA relates to the Strategic Framework.

Statutory Plan

The Strategic Framework will be followed by a Statutory Plan to be commenced during 2022 which will set out a development strategy for the area at a finer level of detail. Further consultation with all stakeholders will be carried out during the preparation of the Statutory Plan.

The SFRA is currently based on the visioning of City Edge Strategic Framework and will be updated during the Statutory Plan Process. Furthermore, the findings of The Camac Flood Alleviation Study (FAS) currently being undertaken can be incorporated.

1.3 Objectives

The purpose of this SFRA is to provide a strategic overview of all forms of flood risk throughout the City Edge Project area, now and in the future. This document and associated mapping delivered as part of the SFRA, will be used as an evidence base by the developers to prepare flood risk assessments and drainage strategies. The aim is to:

- Provide an assessment of flood risk for the project area in accordance with "The Planning System and Flood Risk Management – Guidelines for Planning Authorities" (The Guidelines), 2009, published by the Department for Housing, Local Government, and Heritage and the Office of Public Works (OPW).
- Undertake a Flood Risk Assessment Report assessing the hydrology and hydraulics and determining mechanisms of flooding in the project area, considering the anticipated future increases in rainfall, river flows and sea level rise as a result of climate change.
- Provide recommendations for future flood risk assessments for proposed developments and planning applications, in accordance with The Guidelines.
- Identify Riparian Corridors at a strategic level to protect and enhance watercourses and their natural regimes including ecological, biogeochemical, hydromorphological and flood resilience in the face of climate change.
- Liaison with Consultants completing other types of assessment as well as public consultation.

1.4 Document Structure

This SFRA is broken down into eight sections, as described below:

- **Section 1 (Introduction)** provides an overview of the purpose and objectives of the SFRA.
- **Section 2 (Planning and Policy Framework)** provides an overview of the relevant national and local policies relating to flood risk and associated requirements.
- **Section 3 (Methodology)** outlines the approach conducted for preparation of this SFRA
- **Section 4 (Stage 1 – Flood Risk Identification)** provides a review of the existing information and the identification of any flooding or surface water management issues
- **Section 5 (Stage 2 – Initial Flood Risk Assessment)** provides the assessments undertaken to confirm the sources of flooding and appraises the adequacy of existing information.
- **Section 6 (Flood Risk Assessment Guidance)** provides guidance for developers undertaking Flood Risk Assessments (FRA).
- **Section 7 (Policy Implementation)** provides a set of recommended policies to manage flood risk and surface water.
- **Section 8 (Review and Update)** provides a summary of the proposed update schedule for the SFRA

1.5 City Edge Project Area

City Edge Project lies within the catchment of the River Camac and is presented in Figure 1-1.

Figure 1-1: The Project Area

The project area comprises lands within the jurisdiction areas of Dublin City Council (DCC) and South Dublin County Council (SDCC). The size of the area is 700ha approximately and it is located in West Dublin.

Core spatial uses and concepts are defined as:

- Major centre and employment: Capacity for 65,000 – 75,000 jobs
- Urban industry Capacity for range of employment type
- Residential-led mixed-use Capacity for 75,000 – 85,000 people. Up to 40,000 housing units.

To realise the City Edge Project, a number of "core components" are identified. These represent the key infrastructure that support and catalyse growth and are listed as:

- **Camac River Re-naturalisation** - Deculverting and renaturalising the river Camac and its tributaries to help with climate change resilience and also create a positive setting for future growth.
- **Enhancing the Grand Canal** - Create a more attractive setting for the Canal, enhance active travel routes along it, and enhance biodiversity.
- **Introducing & Enhancing Green & Blue Space** - Introducing new parks and enhancing existing parks in coordination with the renaturalisation of the river and enhancing of the canal, to help with climate change resilience and create a positive setting for future growth.
- **Creating a Tymon to Phoenix Park Greenway** - Link to two enormous assets in the vicinity of the Study Area whilst creating green links both for active travel and for ecology.
- **Undergrounding Pylons** - Increase the developable land available and improve the setting of future growth by undergrounding pylons.
- **Expanding the sewer network** - Supporting future growth by expanding the sewer network whilst coordinating with a study area-wide SuDS strategy.
- **Setting out the street network** - Create a legible movement network for vehicles that responds to accessibility requirements for different uses and provides a parallel cycling network.
- **Introducing orbital connectivity** - Proposal to augment Dublin's orbital connectivity with two routes passing through the Study Area.
- **Introducing New Stations** - Coordinating with the NTA's GDA Strategy for 2022-2042 to create new stations and stops within the study area that can catalyse and support growth.
- **Introducing New Interchanges** - Taking the opportunity to coordinate interchanges between modes across the study area, and to integrate these with new developments.
- **Setting Out Centres & Nodes** - Creating centres and nodes that respond to transport infrastructure and green space and amenity, with a major new centre at Naas Road.
- **Setting Out Land Uses** - Coordinating land uses across the study area to create a cohesive set of districts that support one another.

The regeneration of the City Edge Project lands is consistent with national and regional planning policy, as set out in the National Planning Framework (NPF) and Regional Spatial and Economic Strategy (RSES), respectively. The NPF specifies ambitious targets to achieve compact growth with 50% of housing to be provided within or contiguous to the built-up area of Dublin City and suburbs. To achieve this, the Metropolitan Area Strategic Plan (MASP) (incorporated within the RSES) identifies strategic residential and employment locations along key public transport corridors. City Edge Project area is identified as a key brownfield regeneration opportunity within the South West Strategic Development Corridor.

1.6 Planning Application Considerations

The guidance provided in this SFRA will be used to help consider any planning applications that may occur in advance of the finalisation of a statutory plan. However, flooding is only one of many considerations in assessing a planning application. Measures that are identified as potentially acceptable in addressing flood issues may not be acceptable for other planning reasons under certain circumstances.

1.7 Disclaimer

It is important to note that, although prepared in compliance with the requirements of The Planning System and Flood Risk Management Guidelines for Planning Authorities, 2009, the SFRA is a work in progress and is based on emerging and best available data at the time of preparing the assessment. As a result, all landowners and developers are advised that Nicholas O'Dwyer can accept no responsibility for losses or damages arising due to assessments of the vulnerability to flooding of lands, uses and developments. Owners, users, and developers are advised to take all reasonable measures to assess the vulnerability to flooding of lands and buildings (including basements) in which they have an interest prior to making planning or development decisions.

2 PLANNING AND POLICY FRAMEWORK

2.1 Overview

This section provides an overview of the flood risk policies and requirements at national and local levels. The policies referenced in this section may be superseded in time. To ensure that development proposals are in line with the most up to date policy, it is advised that developers, planning consultants and Local Planning Authority officers keep well-informed of any changes.

2.2 Key Policies and Requirements

2.2.1 Flood Management Policies

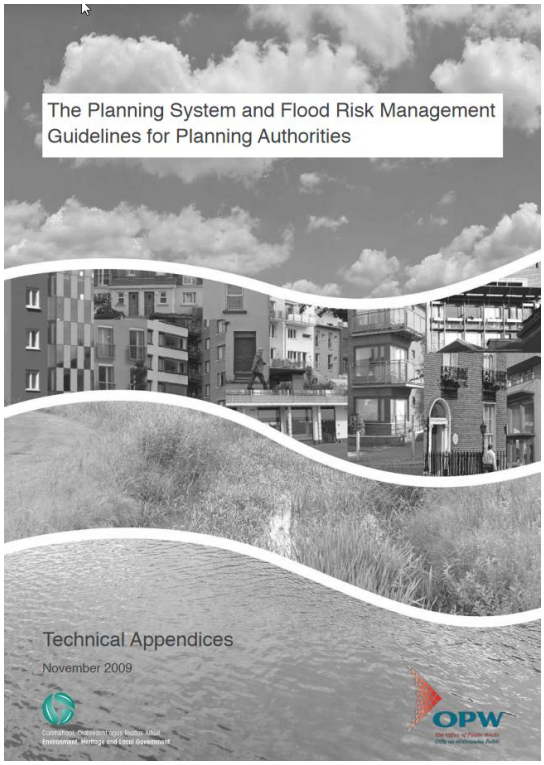
The Arterial Drainage Acts of 1945 and 1995 provide the OPW with powers for drainage and improvement of agricultural land and the undertaking of localised flood defence schemes to reduce flood risk in urban areas.

The OPW is responsible for the implementation of the EU Directive on the Assessment and Management of Flood Risks [2007/60/EC] which was transposed into Irish law by the EU (Assessment and Management of Flood Risks) Regulations SI 122 of 2010. An objective of the Catchment-based Flood Risk Assessment and Management (CFRAM) Programme is to achieve the requirements of the EU Floods Directive.

The functions and responsibilities in relation to coastal protection and coastal flooding transferred from the Department of Agriculture, Fisheries and Food to the OPW on 1 January 2009.

The key flood management policies are:

- "The Planning System and Flood Risk Management Guidelines for Planning Authorities" published in 2009. "Plan, prepare, protect" was published in 2006 (www.flooding.ie) to provide practical advice to the public on how to prepare for potential flooding (revision issued in 2014) (Figure 2-1, left image)
- Guidelines and templates for flood event emergency response plans were prepared in 2008 by the OPW and Department of Housing, Community and Local Government under the Framework for Major Emergency Management (revision issued in 2013) (Figure 2-1, right image)



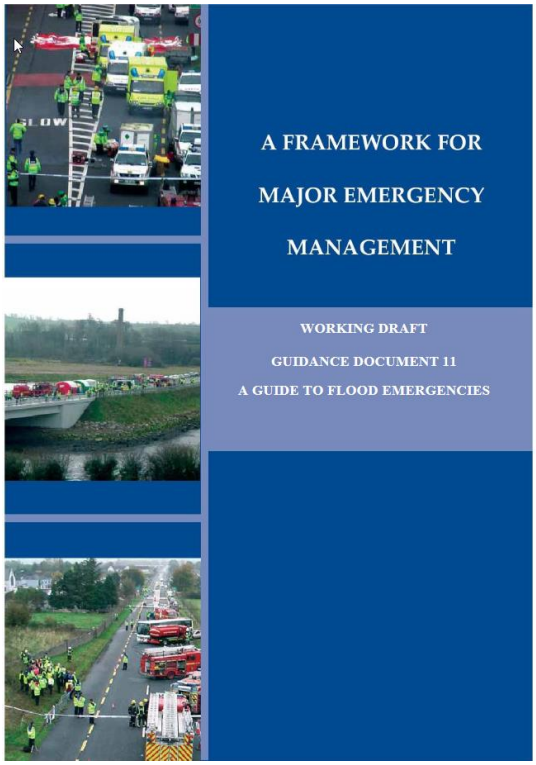


Figure 2-1: Main Guidelines

The following policies provided are as set out in DCC and SDCC Development Plans (2016-2022).

2.2.1.1 Dublin City Council's Policies

Dublin City Council's flood risk management policies are:

- **SI8**: To mitigate the effects of floods and droughts, subject to Environmental Assessment.
- **SI9**: To assist the Office of Public Works in developing catchment-based Flood Risk Management Plans for rivers, coastlines and estuaries in the Dublin city area and have regard to their provisions/recommendations.
- **SI10**: To have regard to the Guidelines for Planning Authorities on the Planning System and Flood Risk Management and Technical Appendices, November 2009, published by the Department of the Environment, Community, and Local Government as may be revised/updated when assessing planning applications and in the preparation of plans both statutory and non-statutory.
- **SI11**: To put in place adequate measures to protect the integrity of the existing Flood Defence Infrastructure in Dublin City Council's ownership and identified in the Strategic Flood Risk Assessment and to ensure that the new developments do not have the effect of reducing the

effectiveness or integrity of any existing or new flood defence infrastructure and that flood defence infrastructure has regard also to nature conservation and amenity issues.

- **SI12**: To implement and comply fully with the recommendations of the Strategic Flood Risk Assessment prepared as part of the Dublin City Development Plan.
- **SI13**: Development of basements or any above ground buildings for residential use below the estimated flood levels for Zone A or Zone B will not be permitted.
- **SI14**: To protect the Dublin City coastline from flooding as far as reasonably practicable, by implementing the recommendations of the Dublin Coastal Flood Protection Project and the Dublin Safer Project.
- **SI15**: To minimise the risk of pluvial (intense rainfall) flooding in the city as far as is reasonably practicable and not to allow any development which would increase this risk.
- **SI16**: To minimise the flood risk in Dublin City from all other sources of flooding, including fluvial, reservoirs and dams and the piped water system.

2.2.1.2 South Dublin County Council's Policies

South Dublin County Council's flood risk management policies are:

- **IE3-1:** To support and co-operate with the Office of Public Works in delivering the Catchment-Based Flood Risk Assessment and Management Programme and in particular the Eastern District CFRAMS and associated Flood Risk Management Plan (FRMP), the River Dodder CFRAMS and associated Flood Risk Management Plan (FRMP). The recommendations and outputs arising from the CFRAM study for the Eastern District shall be considered in preparing plans and assessing development proposals.
- **IE3-2:** To support the implementation of the EU Flood Risk Directive (2007/60/EC) on the assessment and management of flood risks and the Flood Risk Regulations (SI No 122 of 2010).
- **IE3-3:** To manage flood risk in the County in accordance with the requirements of The Planning System and Flood Risk Management Guidelines for Planning Authorities, DECLG and OPW (2009) or any updated version of these guidelines, and Circular PL02/2014 (August 2014) when preparing plans and programmes and assessing development proposals. For lands identified as at risk of flooding in (but not limited to) the Strategic Flood Risk Assessment, a site-specific Flood Risk Assessment (FRA) to an appropriate level of detail, addressing all potential sources of flood risk, is required, demonstrating compliance with the aforementioned Guidelines or

any updated version of these guidelines, paying particular attention to residual flood risks and any proposed site-specific flood management measures.

2.2.2 SuDS Policies

SuDS is a series of management practices and control structures that aim to mimic natural drainage. SuDS reduces flood risk, improves water quality, and provides amenity through the use of permeable paving, swales, green roofs, rainwater harvesting, detention basins, ponds and wetlands. For further information, refer to Section 6.4.

The following policies provided are as set out in DCC and SDCC Development Plans (2016-2022).

2.2.2.1 Dublin City Council's Policies

Dublin City Council's SuDS policy is provided in the following paragraph.

SI18: To require the use of Sustainable Urban Drainage Systems in all new developments, where appropriate, as set out in the Greater Dublin Regional Code of Practice for Drainage Works. The following measures will apply:

- The infiltration into the ground through the development of porous pavement such as permeable paving, swales, detention basins.
- The holding of water in storage areas through the construction of green roofs, rainwater harvesting, detention basins, ponds, wetlands.
- The slowdown of the movement of water

Dublin City Council have also prepared a "Sustainable Drainage Design & Evaluation Guide – 2021" and DCC Green-Blue Roof Guide 2021 (dublincity.ie) which promotes the idea of integrating SuDS into the fabric of development using the available landscape spaces as well as the construction profile of buildings. The document aims to guide the designers in SuDS for new developments within the DCC region. It is also intended to support the evaluation of planning applications against the Policies and Standards set out in Dublin City Development Plan 2022-2028. The guide provides comprehensive information on Stage 1, Stage 2, and Stage 3 design process with examples.

2.2.2.2 South Dublin County Council's Policies

South Dublin County Council's SuDS policies are:

- **IE2-3:** To maintain and enhance existing surface water drainage systems in the County and promote and facilitate the development of Sustainable Drainage Systems (SuDS), including

Integrated Constructed wetlands, at a local, district and County level, to control surface water outfall and protect water quality.

- **IE2-4:** To incorporate Sustainable Drainage Systems (SuDS) as part of Local Area Plans, Planning Schemes, Framework Plans and Design Statements to address the potential for Sustainable Drainage at a site and/or district scale, including the potential for wetland facilities.
- **IE2-5:** To limit surface water runoff from new developments through the use of Sustainable Drainage Systems (SuDS) and avoid the use of underground attenuation and storage tanks.
- **IE2-6:** To promote and support the retrofitting of Sustainable Drainage Systems (SuDS) in established urban areas, including integrated constructed wetlands.
- **G5-1:** To promote and support the development of Sustainable Drainage Systems (SuDS) at a local, district, and county level and to maximise the amenity and biodiversity value of these systems

South Dublin County Council have prepared "Drainage Explanatory Design & Evaluation Guide (2022)".

2.2.3 Green Infrastructure Policies

The following policies provided are as set out in DCC and SDCC Development Plans (2016-2022).

2.2.3.1 Dublin City Council's Policies

Green infrastructure policies of Dublin City Council relevant to drainage and flood risk management are:

- **GI2**: That any plan/project, either individually or in combination with other plans or projects that has the potential to give rise to significant effect on the integrity of any European Site(s) shall be subject to an appropriate assessment in accordance with Article 6(3) and 6(4) of the EU Habitats Directives.
- **GI4**: To co-ordinate open space, biodiversity, and flood management requirements, in progressing a green infrastructure network.
- **GI9:** To incorporate open space into the green infrastructure network for the city providing a multi-functional role including urban drainage, flood management, biodiversity, outdoor recreation, and carbon absorption.

- **GI14**: To promote the development of soft landscaping in public open spaces, where feasible, in accordance with the principles of Sustainable Urban Drainage Systems.

Dublin City Council have recently prepared the "Green & Blue Roof Guide – 2021" which confirms DCC's specific requirements in relation to green and blue roofs and expands on how schemes should deliver in accordance with Development Plan Policy S123.

- **S123**: To require all developments with roof areas in excess of 100 sq. metres to provide for a green blue roof in accordance with the requirements of Dublin City Council's Green & Blue Roof Guide (2021)

2.2.3.2 South Dublin County Council's Policies

Green infrastructure policies of South Dublin City Council relevant to drainage and flood risk management are:

- **G1 Overarching**: It is the policy of the Council to protect, enhance and further develop a multifunctional Green Infrastructure network by building an interconnected network of parks, open spaces, hedgerows, grasslands, protected areas, and rivers and streams that provide a shared space for amenity and recreation, biodiversity protection, flood management and adaptation to climate change.

- **G3-3**: To ensure the protection, improvement, or restoration of riverine floodplains and to promote strategic measures to accommodate flooding at appropriate locations, to protect ground and surface water quality and build resilience to climate change.

2.2.4 Riparian Zone Policies/Objectives

The objectives to protect and enhance the riparian zones in Strategic Flood Risk Assessment of South Dublin County Development Plan 2022-2028 are as follows:

1. To ensure that hydromorphological assessments are undertaken where proposed development is within lands which are partially or wholly within the riparian corridors identified in this SFRA.

2. To require development proposals that are within riparian corridors to demonstrate how the integrity of the riparian corridor can be maintained and enhanced having regard to flood risk management, biodiversity, ecosystem service provision, water quality and hydromorphology.

3. To promote and protect native riparian vegetation along all watercourses and ensure that a minimum 10m vegetated riparian buffer (recommended by SDCC SFRA) from the top of the riverbank is maintained or reinstated along all watercourses within any development site.

2.2.5 Climate Change Policies

The OPW has prepared a Climate Change Sectoral Adaptation Plan for Flood Risk Management, in line with the requirements of the National Adaptation Framework and the Climate Action Plan 2019. Dublin City Council's and South Dublin County Council's climate change mitigation policies are provided in the following sections.

The following policies provided are as set out in DCC and SDCC Development Plans (2016-2022).

2.2.5.1 Dublin City Council's Policies

Dublin City Council's climate change policies are:

- **CC1**: To prioritise measures to address climate change by way of both effective mitigation and adaptation responses in accordance with available guidance and best practice.
- **CC5**: To address flood risk at strategic level through the process of strategic flood risk assessment, and through improvements to the city's flood defences.

2.2.5.2 South Dublin County Council's Policies

South Dublin County Council's climate change policies are:

- Development of further flood alleviation schemes
- Cross-boundary flood management with neighbouring local authorities
- Coordinating our emergency response plans

2.3 Responsibilities

2.3.1 Department of Housing, Local Government and Heritage

Department of Housing, Local Government and Heritage and The Office of Public Works (OPW) jointly published "The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices" in November 2009. The aim of this publication is to ensure a systematic approach to assessment of flood risk and managing those risks in design of new developments.

This document defines the responsibilities of regional authorities, local authorities (LA), OPW, developers, and planners.

2.3.2 Office of Public Works

The Office of Public Works (OPW), part of the Department of Public Expenditure and Reform, is the lead agency for the co-ordination and implementation of Government policy on flood risk management in Ireland. OPW develops and implements policies and strategies for flood risk management The OPW is also the national authority for the implementation of the EU Directive on the Assessment and Management of Flood Risks [2007/60/EC].

The primary functions of the OPW Flood Risk Management Programme are:

- to develop and deliver on flood risk management work programmes and measures;
- to maintain an effective programme of maintenance of river courses drained under the provisions of the Arterial Drainage Acts; and
- to advise the Government on flood risk management and flood risk management policy.

The OPW funds investment in capital works projects and measures to reduce the likelihood of flooding in areas at risk of flooding. This investment is provided for major urban flood relief projects (carried out by the OPW directly or by Local Authorities acting on the OPW's behalf) and for localised minor flood mitigation works which are undertaken by Local Authorities with funding provided by the OPW.

OPW Flood Defence Schemes are generally carried out under the Arterial Drainage Act 1945 and the Arterial Drainage Amendment Act 1995, although in recent years some phases of schemes have been carried out by the Local Authorities under the Planning and Development Regulations.

The OPW Minor Flood Mitigation Works & Coastal Protection Scheme provides funding to Local Authorities to undertake minor flood mitigation works or studies, costing less than €0.5 million, to address localised flooding and coastal protection problems within their administrative areas. The CFRAM study will provide appropriate supporting information to allow applications for minor works to be put forward by the local authorities.

2.3.3 Irish Water

Irish Water is responsible for flooding from the combined sewers that are generally found in older urban areas. Responsibility for implementation and operation of stormwater drainage networks belongs to the relevant Local Authority (LA) or the OPW.

Some of the combined sewers do not have the capacity to handle heavy rainfall and this can result in sewer flooding. During intense rainfall, the combined sewer overflows (CSOs) also discharge excess flows into nearby watercourses. Irish Water is proposing several strategies to deal with these issues,

including identifying and recording properties at risk of flooding from combined sewers and implementing measures to reduce and mitigate the risk, and also to deliver measures to reduce the pollution impact from combined sewer overflows. It is also noted that in their plan Irish Water recognise that climate change will cause greater frequency of extreme weather events and it will be important to adapt their assets to be resilient to climate change impacts and to mitigate their impact by reducing their carbon footprint.

2.3.4 Local Authorities (Councils)

Local Authorities are responsible for introducing flood risk assessments in accordance with "The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009". All local area plans (LAPs) are to be supplemented by detailed Site-Specific Flood Risk Assessments.

Local Authorities are also responsible for the repair and maintenance of flood and coastal defence structures in their ownership and management.

2.3.5 Developers

Developers are required to carefully examine their development proposals to ensure consistency with the requirements set out in 'The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009' and within this SFRA. This includes thoroughly investigating whether there have been instances of flooding on specific sites and stating any known flood history on the planning application form as required. Developers are also encouraged to engage with the Local Authorities at an early stage regarding any flood risk assessment issues that may arise. They are required to carry out a Site-Specific Flood Risk Assessment and comply with the terms and conditions of any grant of planning permission with regards to the minimisation of flood risk.

2.3.6 Property Owners

It is the responsibility of property owners to look after their property which includes protecting it from flooding. It is a vital role of individuals, communities, and businesses to manage flood risks.

Property or landowners who own land which is adjacent to a watercourse, or which has a watercourse running through it, are riparian owners and have certain legal responsibilities to maintain the watercourse. Where a watercourse marks the boundary between adjoining properties, it is normally presumed the riparian owner owns the land up to the centre line of the watercourse.

3 METHODOLOGY

3.1 Overview

This report has been prepared in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' herein referred to as 'The Guidelines'.

3.2 Definition of Flood Risk

Flood Risk is defined as a combination of the likelihood of flooding occurring and the potential consequences arising from that flooding. The likelihood of flooding is defined as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year by The Guidelines. Return periods are often used to describe how often a flooding event will occur. Return periods are an average of how often a flood event of that magnitude will occur. Probability or chance of flooding can also be used instead, such as a 1 in 50-year flood has a 2 per cent probability of occurring in any one year. To this end, the term "annual exceedance probability" (AEP) is used to define the probability of a flood event occurring in any given year.

Consequences of flooding is defined in The Guidelines as the hazards associated with the flooding and the vulnerability of people, property and the environment potentially affected by a flood.

3.3 Source-Pathway-Receptor Model

Source – Pathway – Receptor Model (SPR Model) is a general model to assess and inform the management of environmental risk.

- **Source** is defined as the origin of a hazard, such as a rainfall, wind, etc
- **Pathway** is the route that a hazard takes to reach to the receptors. A pathway must exist for a hazard to happen.
- **Receptor** refers to the any entity that is vulnerable, such as a person or a property.

All three elements along with the vulnerability and exposure of all receptors needs to be evaluated for determining the potential consequences.

3.4 Flood Zones

The flood zones are based on the likelihood of an area flooding and are split into three categories, with Flood Zone A areas more likely to flood and Flood Zone C areas least likely to flood. It should be noted that these flood zone don't consider blocked drains, etc. so sites in a low-risk flood zone could still experience flooding.

- **Flood Zone A**: High probability of flooding – Most forms of development are inappropriate within this zone, only water-compatible development would be allowed.
    - probability of fluvial flooding is greater than 1 in 100 (1% AEP)
    - probability of coastal flooding is greater than 1 in 200 (0.5% AEP)
- **Flood Zone B**: Moderate probability of flooding – Highly vulnerable development (hospitals, Garda buildings, car parks, fire and ambulance stations, dwelling houses and strategic transport and utilities infrastructure) are deemed to be inappropriate within this zone.
    - probability of fluvial flooding is between 1 in 100 (1% AEP) and 1 in 1000 (0.1% AEP)
    - probability of coastal flooding is between 1 in 200 (0.5% AEP) and 1 in 1000 (0.1% AEP)
- **Flood Zone C**: Low probability of flooding
    - probability of fluvial flooding is less than 1 in 1000 (0.1% AEP)
    - probability of coastal flooding is less than 1 in 1000 (0.1% AEP)

'The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009' ignores the presence of flood defences when defining flood zones; this is since even areas that benefit from an existing flood defence can still be vulnerable due to the speed when overtopping or a breach or other failure takes place. Therefore, the residual risk of flooding where appropriate should be assessed as part of the application of the justification test and, if the site is zoned for development, through the site-specific flood risk assessment

3.5 Core Objectives and Principles of The Guidelines

The core objectives of The Planning System and Flood Risk Management Guidelines for Planning Authorities are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water run-off;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic growth;
- Improve the understanding of flood risk among relevant stakeholders;

- Ensure that the requirements of the EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

To achieve the objectives of the Guidelines, the following principles were applied:

- Avoid the 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.

3.6 Scales of Flood Risk Assessment

- **Regional Flood Risk Appraisal** provides a broad overview of the sources and consequences of all types of flood risk through a region and highlights areas where a more comprehensive study needs to be conducted. It is the regional authorities' responsibility to undertake regional flood risk appraisals.
- **Strategic Flood Risk Assessment** provides an assessment of all types of flood risk to be considered during land use planning decisions. These assessments will help the Planning Authorities to assign suitable sites for development, whilst identifying opportunities for reducing flood risk (SFRA completed as part of the Strategic Framework process).
- **Site-Specific Flood Risk Assessment** is required in accordance with the OPW document "The Planning System and Flood Risk Management" when a Local Authority considers there is a risk of flooding. A site-specific flood risk assessment is undertaken to assess all types of flood risk for a new development. This requires identification of the sources of flood risk, the effects of climate change on the flood risk, the impact of the proposed development, the effectiveness of flood mitigation and management measures and the residual risks that then remain.

3.7 Structure of a Flood Risk Assessment

The Guidelines recommend that a staged approach is adopted when undertaking a flood risk assessment. The recommended stages are set out briefly below:

- **Stage 1 – Flood Risk Identification:** To identify whether there may be any flooding or surface water management issues that will require further investigation. This stage mainly comprises a comprehensive desktop study of available information to establish whether a flood risk issue exists or whether one may exist in the future (completed as part of the Strategic Framework process).

- **Stage 2 – Initial Flood Risk Assessment:** If a flood risk issue is deemed to exist from the Stage 1 – Flood Risk Identification process, the assessment proceeds to Stage 2 to confirm the sources of flooding, evaluate the adequacy of existing information and determine the extent of possible additional surveys and the degree of modelling that will be required. Stage 2 must be sufficiently detailed to allow the application of the sequential approach within the flood risk zone.

- **Stage 3 – Detailed Flood Risk Assessment:** A Stage 3 - Detailed Flood Risk Assessment must be undertaken where Stages 1 and 2 indicate that a proposed area of possible zoning or development may be subject to a significant flood risk.

3.8 The Sequential Approach

The sequential approach in terms of flood risk management is based on the following principles:

- **Avoid:** The primary objective of the sequential approach is that development is primarily directed towards land that is at low risk of flooding.

- **Substitute:** The next stage is to ensure that the type of development proposed is not especially vulnerable to the adverse impacts of flooding.

- **Justify:** The Justification Test is designed to assess the appropriateness of developments that are being considered in areas of moderate or high flood risk.

- **Mitigate:** It should be ensured that the flood risk is reduced to an acceptable level.

- **Proceed:** only where Justification Test passed.

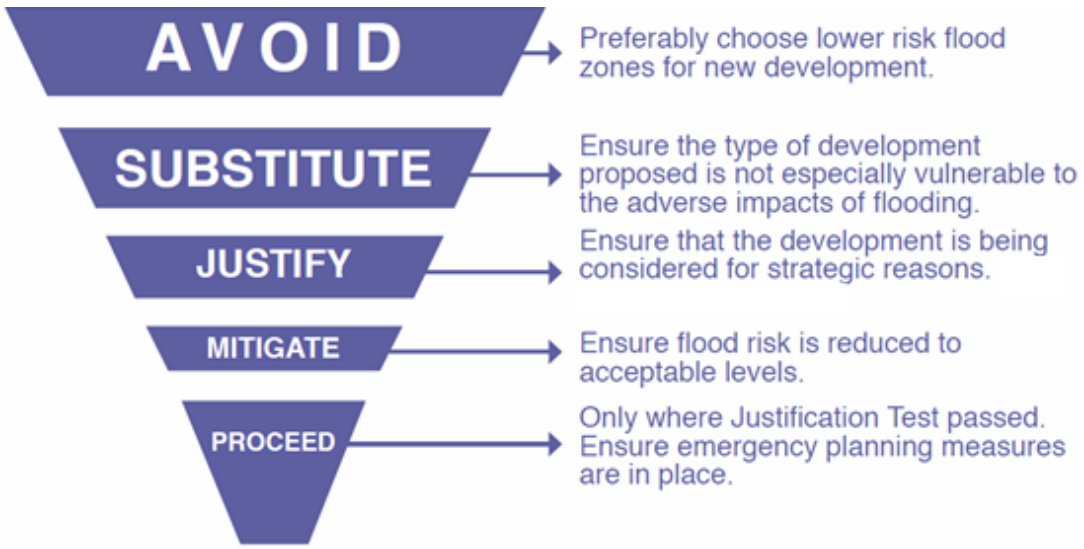


Figure 3-1: Sequential Approach

The Justification Test is comprised of two processes:

- The Plan-Making Justification Test
- The Development Management Justification Test.

Only "Plan-Making Justification Test" is relevant to a Strategic Flood Risk Assessment for a Development Plan, and this is described in the next section.

3.9 The Justification Test

The Justification Test is an assessment of whether a development proposal within an area at risk of flooding meets specific criteria for proper planning and sustainable development and demonstrates that it will not be subject to unacceptable risk nor increase flood risk elsewhere. The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of particular developments. The test should be applied only where development is within flood risk areas that would be defined as inappropriate under the screening test of the sequential risk-based approach adopted by this guidance.

The test comprises of 2 processes:

1. The first is the Plan-making Justification Test described in chapter 4 of "The Planning System and Flood Risk Management - 2009" and 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.

2. The second is the Development Management Justification Test described in chapter 5 of "The Planning System and Flood Risk Management - 2009" and 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.

Exceptions to the development restrictions are provided where re-zoning is not possible through the Justification Test. Many towns and cities have central areas that are affected by flood risk and have been targeted for growth. To allow the sustainable development of these urban centres, development in areas of flood risk may be considered necessary. For allowing development in such areas, the Justification Test must be passed.

Table 3-1 shows the types of development that would be required to meet The Justification Test.

Table 3-1:Justification Test Requirements (from The Guidelines)

Vulnerability Class	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

4 STAGE 1 - FLOOD RISK IDENTIFICATION

4.1 Overview

This flood risk identification study was conducted to identify whether there may be any flooding or surface water management issues that will require further investigation in the project area. Flood risk mapping are based on CFRAM.

4.2 Sources of Flooding

This section explains the flooding sources which may affect the project area. The relevant maps showing the flooding extents are also provided in appendices.

4.2.1 Fluvial Flooding

Fluvial flooding happens when the water level in a water body such as a river or lake rises and overflows onto the surrounding areas. The water level rise could be due to excessive rain or snowmelt. The impact of fluvial flooding on urban environments could be severe, causing significant social, economic, and environmental impacts.

The duration and intensity (volume) of rainfall in the catchment area of the river are the main factors to determine the severity of a river flood. There are other factors which are equally important including soil water saturation and the terrain surrounding the river system. Floodwater rises more slowly and is shallower in flatter areas, whereas floods can occur within minutes after a heavy rain in mountainous areas.

The maps showing risk of flooding from fluvial sources are provided in Appendix A. Medium risk zones of flooding are determined by the areas flooded by the rainfall with 1% AEP (annual exceedance probability) and Low risk zones of fluvial flooding are the areas flooded by the rainfall with 0.1% AEP.

Main rivers that could contribute to fluvial flooding in the City Edge Project area are listed below and also presented in Figure 4-1:

- River Camac
- Walkinstown Stream
- Ballymount Stream
- Robinhood Stream
- Gallanstown Stream

- Drimnagh Castle Stream

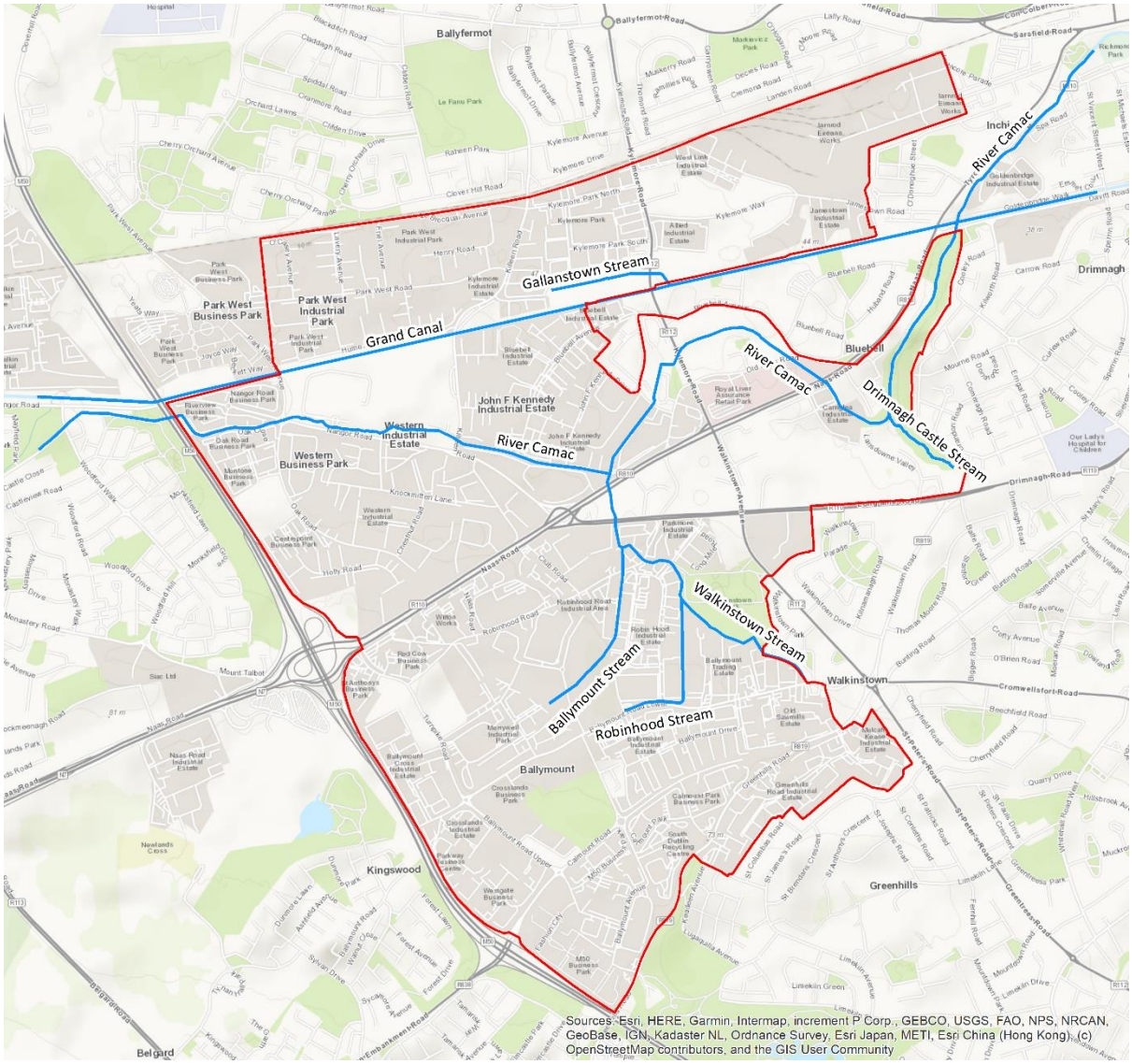


Figure 4-1: River Camac and Tributaries

The major risk of fluvial flooding in the City Edge area is caused by the culverted sections of natural rivers noted in Figure 4-1. As a result of culverting the rivers, natural floodplains are no longer available to effectively dissipate effects of increased water level on-site and therefore amplifies the risks of damage that can be caused by fluvial flooding.

4.2.2 Pluvial Flooding

A pluvial flood occurs when an extreme rainfall event creates a flood independent of an overflowing water body. There are two common types of pluvial flooding:

- Surface water floods occur when an urban drainage system is flooded, and water flows out into streets and nearby structures. It occurs gradually, which provides people time to move to

safe locations, and the level of water is usually shallow. It generally creates no threat to lives but may cause significant economic damage.

- Flash floods are characterized by an intense, high velocity torrent of water triggered by torrential rain falling within a short amount of time within the vicinity or on nearby elevated terrain. They can also occur via sudden release of water from an upstream levee or a dam. Flash floods are very dangerous and destructive not only because of the force of the water, but also the debris that is often carried by the flow.

Pluvial flooding maps are provided in Appendix B.

4.2.3 Coastal Flooding

Coastal flooding is the inundation of land areas along the coast by seawater. Common causes of coastal flooding are intense windstorm events occurring at the same time as high tide (storm surge), and tsunamis.

Storm surge is created when high winds from a windstorm force water onshore — this is the leading cause of coastal flooding and often the greatest threat associated with a windstorm. The effects increase depending on the tide - windstorms that occur during high tide result in devastating storm surge floods. In this type of flood, water overwhelms low-lying land and often causes devastating loss of life and property.

The severity of a coastal flood is determined by several other factors, including the strength, size, speed, and direction of the windstorm. The onshore and offshore topography also plays an important role. To determine the probability and magnitude of a storm surge, coastal flood models consider this information in addition to data from historical storms that have affected the area.

The River Liffey is at risk of coastal flooding. The risk of flooding from tidal sources during 0.1% AEP event is shown in the map provided in Appendix C. The project area is not affected by coastal flooding.

4.2.4 Groundwater Flooding

Groundwater flooding can happen when an underground water table rises, which may result in water emerging through the ground. This source of flooding generally occurs after long periods of heavy rainfall. During these extensive periods of rainfall, a greater volume of water infiltrates through the ground, causing underlying aquifers inability to drain the increased flow away quickly enough. Lowlands, where the water table is likely to be closer to the surface, pose greater risks of groundwater flooding.

Risk management of groundwater flooding poses a distinctive set of technical and environmental challenges that differentiate it from other sources of flooding. According to Geological Survey Ireland (GSI), groundwater flooding in Ireland occurs mainly on the limestone lowlands, such as west of the Shannon.

GSI groundwater flood probability maps indicate that the project area is not prone to groundwater flooding. It should be noted that GSI maps only shows groundwater flood extents in limestone regions.

4.2.5 Sewer Flooding

Sewer flooding can happen due to drainage infrastructure failure or due to an increased flow and volume of water entering a drainage system which exceeds its design capacity, causing the network to surcharge. Sewer flooding can also occur if the outfalls are either blocked or submerged due to high water levels in receiving environment. Outfall inadequacy may lead to a water back up in a sewer system and cause flooding. Any possible blockages caused by debris or sediment accumulation can further exacerbate the probability of sewer flooding.

Most of the sewer system comprises of separate storm and foul networks in the project area. However, the storm network is intertwined with the culverted River Camac system. This may lead to a storm sewer system flooding caused by increased water levels at outfall points. Therefore, it is believed that any improvement to reduce flood risk of the River Camac system will directly affect the conveyance capacity of storm sewer network.

The Sewer 9B, which is the main trunk foul sewer network passes directly through the project area and presented in Figure 4-2. Information obtained from Irish Water indicated that Sewer 9B is operating at its hydraulic capacity now. Possible misconnections of surface water to foul sewer network may increase the risk of surcharge of foul sewer network as foul sewer networks are typically designed to accommodate up to 1 in 30-year rainfall events. To this end, it is vital that all misconnections should be carefully investigated and disconnected from foul sewer network.

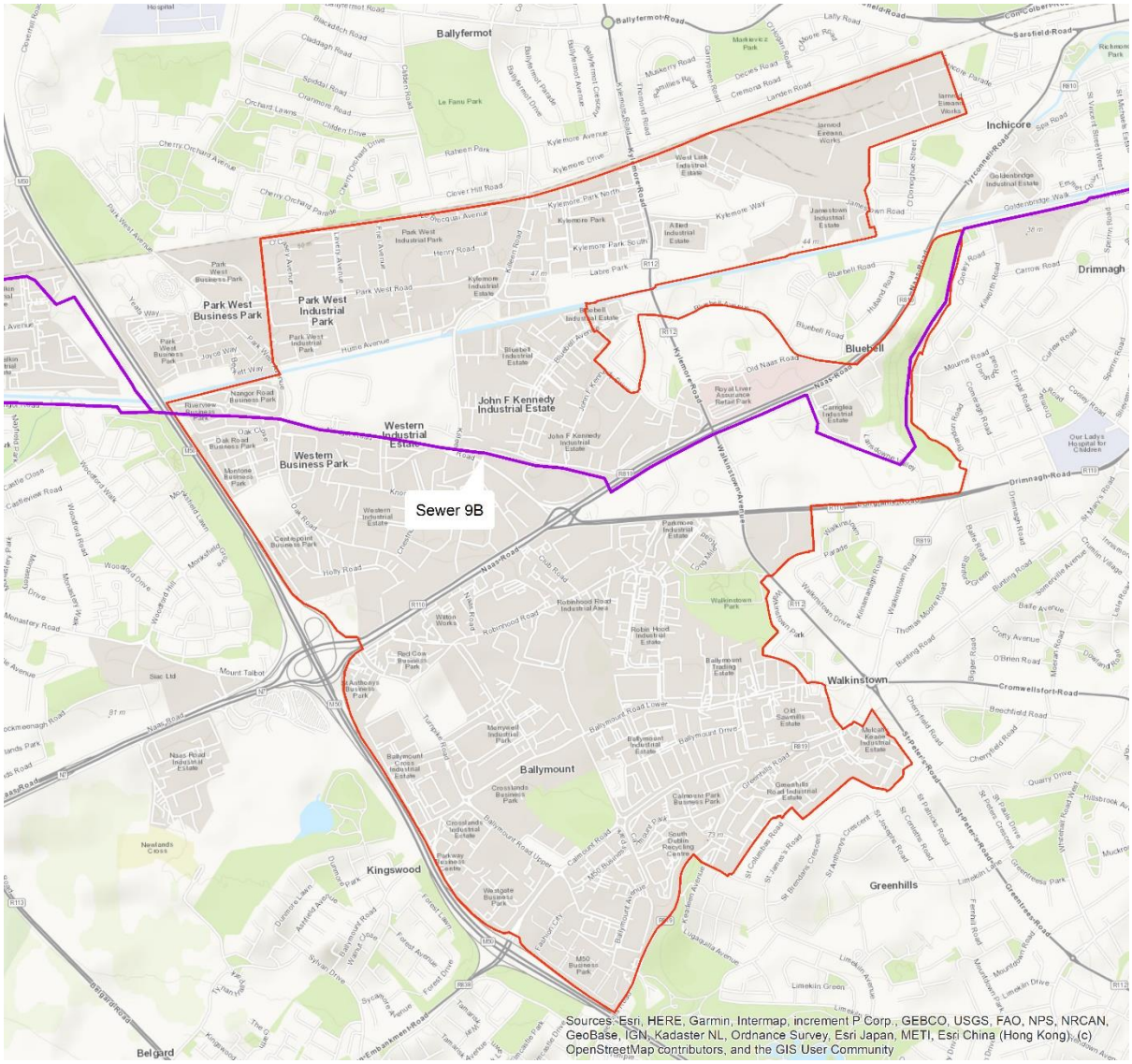


Figure 4-2: Route of Sewer 9B

4.2.6 Artificial Sources Flooding

Artificial Flooding can happen when the failure of infrastructure or human intervention results in flooding. Artificial flood sources include reservoirs, canals, water retention ponds, docks, and other artificial structures. Although the probability of a structural breach is low, the potential extent of damage is significant. Flooding from an artificial source could leave many properties at risk.

The Grand Canal passes through northside of the project area and has several locks to control the water level in the canal and allow barges to navigate. It is important to preserve the infrastructure by sediment removal, canal bank maintenance, repairs of navigation infrastructure, and maintain other appurtenant structures.

4.3 Past Floods

Past floods that occurred in the project area are summarized in the following sections. Locations of the past flood events are also provided in Appendix D.

4.3.1 Flooding in the Camac Catchment – 05 November 2000

Several locations were flooded in River Camac Catchment on 5th of November 2000. More information on the flood event is available at www.floodinfo.ie .

https://s3-eu-west-1.amazonaws.com/floodmaps.floodinfo.ie/Reports/F310%20Data%20Collection/030%20South%20Dublin%20County%20Council/002%20Reports/sdc_re_jf_0000001249.pdf

4.3.2 Flooding at Riverview Business Centre – 24 October 2011

The flood event started on 24 October 2011 and reached to peak flow on the same day. The River Camac was the source of flooding. The River Camac overspilled its banks and flooded the car park of Riverview Business Park.

Max flood depth was measured as 0.1m. There was no loss of life or injury. One residential property was affected. More information on the flood event including flood extents is available at www.floodinfo.ie .

https://s3-eu-west-1.amazonaws.com/floodmaps.floodinfo.ie/Reports/F310%20Data%20Collection/005%20OPW%20Trim/002%20Reports/opt_re_OT_0000012087.pdf

4.3.3 Flooding at DIAGEO, Nangor Road – 24 October 2011

The flood event started on 24 October 2011 and reached to peak flow on the same day. The River Camac was the source of flooding. The River Camac overspilled its banks and flooded the factory site owned by DIAGEO. The factory had to be closed for 1 week.

Max flood depth was measured as 0.6m, whereas the average flood depth was 0.3m. There was no loss of life or injury. One residential and one commercial (DIAGEO) property were affected. More information on the flood event including flood extents is available at www.floodinfo.ie .

https://s3-eu-west-1.amazonaws.com/floodmaps.floodinfo.ie/Reports/F310%20Data%20Collection/005%20OPW%20Trim/002%20Reports/opt_re_OT_0000012008.pdf

4.3.4 Flooding at Robinhood Industrial Estate – 24 October 2011

The flood event started on 24 October 2011 and reached to peak flow on the same day. The River Camac was the source of flooding. A tributary of River Camac (Ballymount Stream) overspilled its banks and flooded the Robinhood Industrial Estate.

Max flood depth was measured as 0.3m. There was no loss of life or injury. One vehicle service and one warehouse/storage building located either side of the stream were affected. More information on the flood event including flood extents is available at www.floodinfo.ie .

https://s3-eu-west-1.amazonaws.com/floodmaps.floodinfo.ie/Reports/F310%20Data%20Collection/005%20OPW%20Trim/002%20Reports/opt_re_OT_0000012094.pdf

4.3.5 Flooding at Walkinstown Crescent – 24 October 2011

The flood event started on 24 October 2011 and reached to peak flow on the same day. This was a pluvial/sewer flooding that overwhelmed the storm sewer network which was unable to the drain stormwater and flooded the low areas.

Average flood depth was measured as 0.4m. There was no loss of life or injury. Four residential properties were affected, and 100m-long section of Walkinstown Crescent was flooded. More information on the flood event including flood extents is available at www.floodinfo.ie .

https://s3-eu-west-1.amazonaws.com/floodmaps.floodinfo.ie/Reports/F310%20Data%20Collection/005%20OPW%20Trim/002%20Reports/opt_re_OT_0000012099.pdf

4.3.6 Recurring Flooding of Camac Culvert at Old Naas Road

The culvert of the River Camac close to the Irish Farm Centre, Old Naas Road was reported as suffering from recurring floods. Problems with structural integrity of the culvert were also reported. More information on the recurring flood event site is available at www.floodinfo.ie .

https://s3-eu-west-1.amazonaws.com/floodmaps.floodinfo.ie/Reports/F310%20Data%20Collection/030%20South%20Dublin%20County%20Council/004%20Minutes%20Verbal%20Report/sdc_mm_jf_0000001631.pdf

4.3.7 Recurring Flooding of Robinhood Stream, Walkinstown

More information on the recurring flood event site is available at www.floodinfo.ie .

https://s3-eu-west-1.amazonaws.com/floodmaps.floodinfo.ie/Reports/F310%20Data%20Collection/030%20South%20Dublin%20County%20Council/004%20Minutes%20Verbal%20Report/sdc_mm_jf_0000001631.pdf

https://s3-eu-west-1.amazonaws.com/floodmaps.floodinfo.ie/Reports/F310%20Data%20Collection/030%20South%20Dublin%20County%20Council/002%20Reports/sdc_re_jf_0000002438.pdf

4.4 Impacts of Climate Change

Impact of climate change on flooding was also provided in Appendix A and C. Assessment of climate change scenarios for different sources of flooding are provided in Table 4-1.

Table 4-1: Climate change scenarios per flood source

Sources of Flooding	Climate Change Scenarios
Fluvial	1 in 10-year probability event + 30% increase in rainfall + 1.0m sea level rise 1 in 100-year probability event + 30% increase in rainfall + 1.0m sea level rise 1 in 1000-year probability event + 30% increase in rainfall + 1.0m sea level rise
Pluvial	No specific climate change impact assessments have been completed for this flood risk source.
Coastal	1 in 1000-year probability event + 20% increase in rainfall + 0.5m sea level rise 1 in 1000-year probability event + 30% increase in rainfall + 1.0m sea level rise
Groundwater	No specific climate change impact assessments have been completed for this flood risk source.

4.5 Riparian Zones

A riparian zone is defined as the interface between land and a stream. Riparian zones have utmost importance in ecology, environmental management, and civil engineering.

Riparian zones reduce the effects of floods by slowing down the runoff and providing temporary storage areas. Trees and grasses in riparian areas stabilize streambanks and reduce floodwater velocity, resulting in reduced downstream flood peaks. Irreversible damage to natural riparian zones can increase the vulnerability of surrounding area to flooding.

It should be noted that one of the core component of the Strategic Framework is the Camac Flood Alleviation Plan and denaturalisation of the river which will include promoting net Biodiversity gain for the river and its associated riparian corridors.

4.5.1 Riparian Habitat

Riparian land provides vital habitat for native plants and animals. The vegetation along rivers and streams provides a connection for native plants and animals to move between patches of vegetation in the landscape.

Trees on riparian zones provide a supply of organic matter to waterways, providing food and habitat for fish and other aquatic animals. Shade from riparian vegetation also helps regulate water temperature, which can be important to fish and helps reduce the likelihood of algal blooms.

The plants on riparian zones play an important role in protecting water quality by filtering nutrients and sediment out of run-off entering waterways. Good coverage of vegetation also reduces soil erosion and flood damage by stabilising the riverbed and banks.

By managing riparian zones well, there are opportunities to manage climate change and its impacts. Riparian vegetation helps mitigate climate change by absorbing carbon.

4.5.2 Flood Zoning

Assessing and flood zoning of floodplains throughout the catchment is key to defining the approach to development lands. The impacts of climate change should be considered as the areas liable to flood in the near future may increase significantly over present-day extents.

Indicated flood risk areas for 1% and 0.1% AEP events for future scenario along with riparian corridors are provided in Figure 4-3. In this map, dark blue regions represent the flood extend of a 1% AEP event with 30% climate change uplifting factor and light blue regions indicate the flood extend of a 0.1% AEP event with 30% climate change uplifting factor. Designated riparian corridor is bounded by green dashed lines. Larger format maps are also provided in Appendix E.

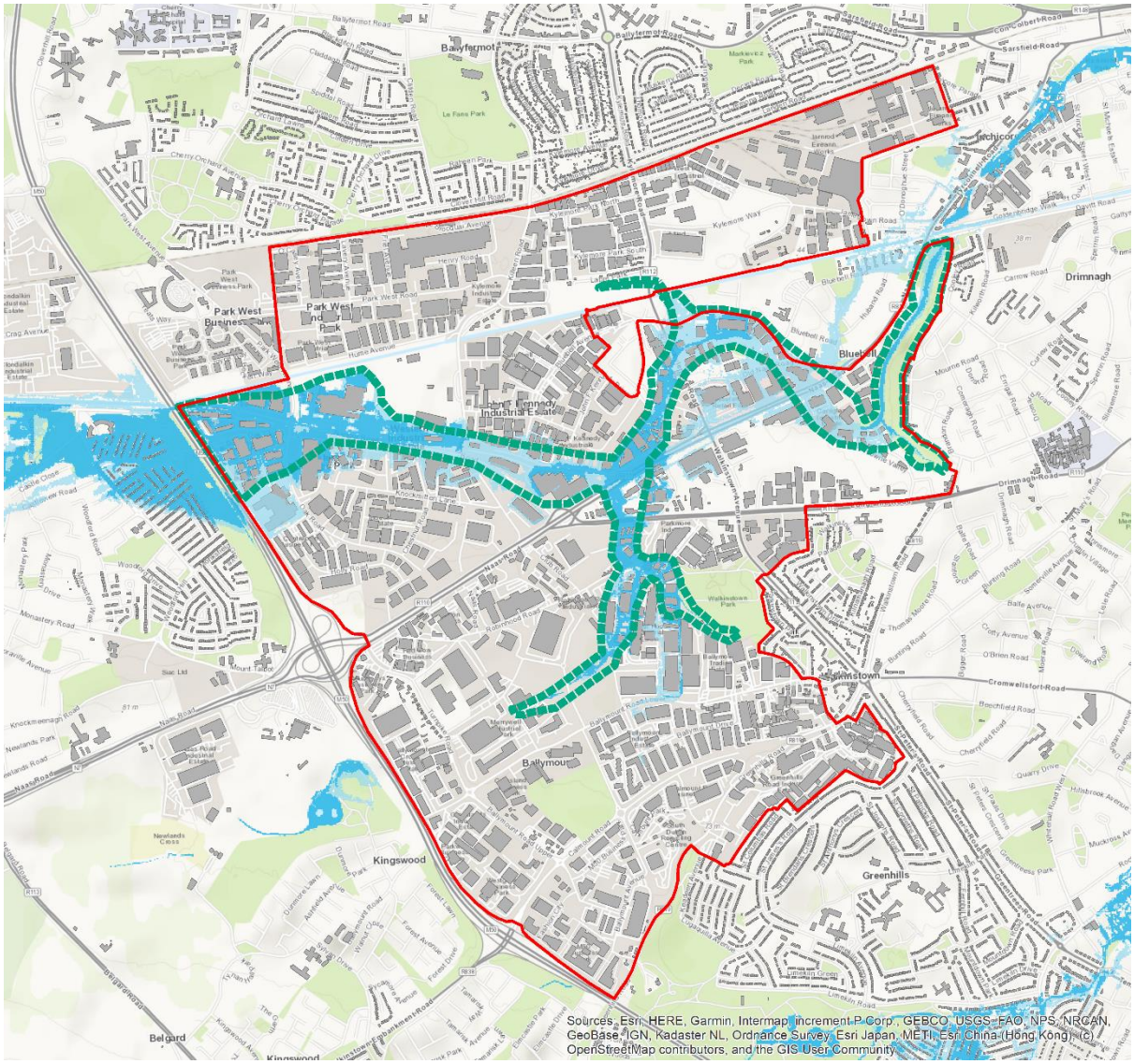


Figure 4-3: Indicated flood risk areas (with 30% climate change uplift) and riparian corridors (in green) for the project area

5 STAGE 2 – INITIAL FLOOD RISK ASSESSMENT

5.1 Overview

Stage 2 – Initial Flood Risk Assessment study was conducted to confirm sources of flooding that may affect the plan area, to appraise the adequacy of existing information and to scope the need for additional assessment.

5.2 Identification of Key Areas at Risk of Flooding

Figure 5-1 includes a key plan of the flood risk areas along the River Camac.

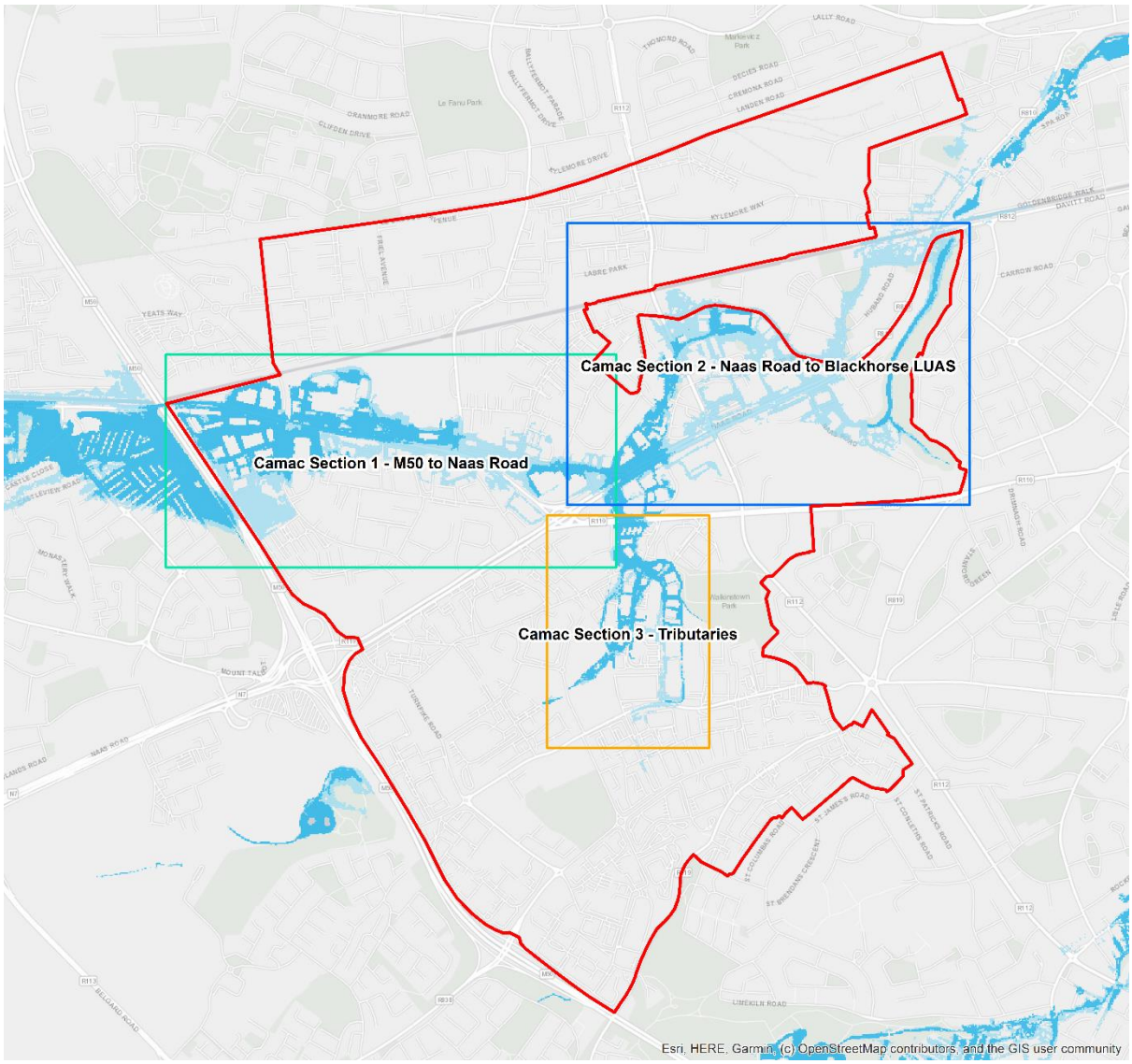


Figure 5-1: Key plan for sectional areas of the Camac assessed for flooding risk

5.2.1 Camac Section 1 – M50 to Naas Road (Nangor Road)

River Camac flows from Clondalkin to the City Edge Area at M50 – Nangor Road Overpass. There are some sections where the river channel is open and natural, but significant portion of the river is culverted after DIAGEO Plant towards Naas Road. The river mainly follows the path of Nangor Road. An extensive storm (surface) water drainage network discharges to the River Camac. The area is heavily developed by mainly industrial units.

The site does not benefit from formal defences. The CFRAM Study for the Camac did not reveal any overall flood alleviation scheme for the catchment, except for flood awareness and flood warning systems.

Present day Flood Zones A, B, and C (refer to Section 3.4) are provided in Figure 5-2 to Figure 5-4.

Figure 5-2: Flood Zone A – Carparks at DIAGEO Facilities

Figure 5-3: Flood Zone B – Nangor Road, Riverside Business Park, Oak Road Business Park, and Carparks at DIAGEO Facilities

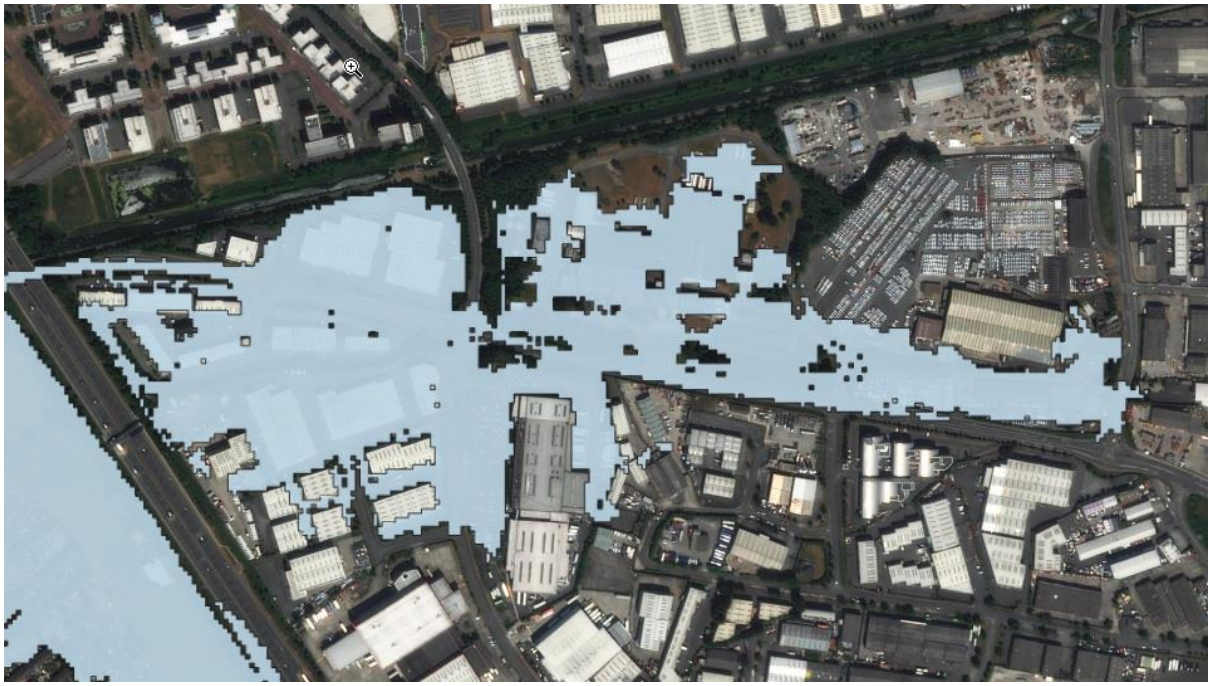


Figure 5-4: Flood Zone C – Nangor Road, Riverside Business Park, Nangor Road Business Park, Oak Road Business Park, Western Business Park, and DIAGEO Facilities

Sensitivity to climate change of the Camac Section 1 is moderate to high. There are some parts of Camac Section 1 indicating climate change is likely to give an increase in risk (see Figure 5-5 to Figure 5-7).

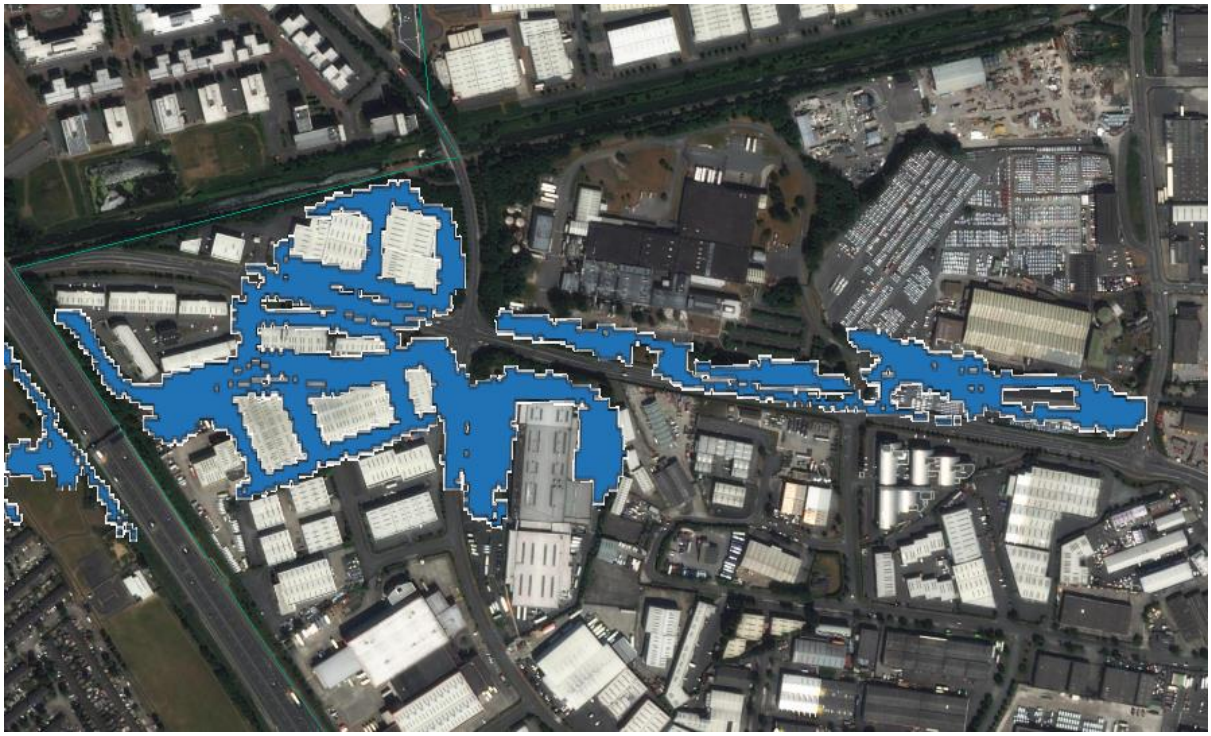


Figure 5-5: Flood Zone A with 30% climate change uplifting factor

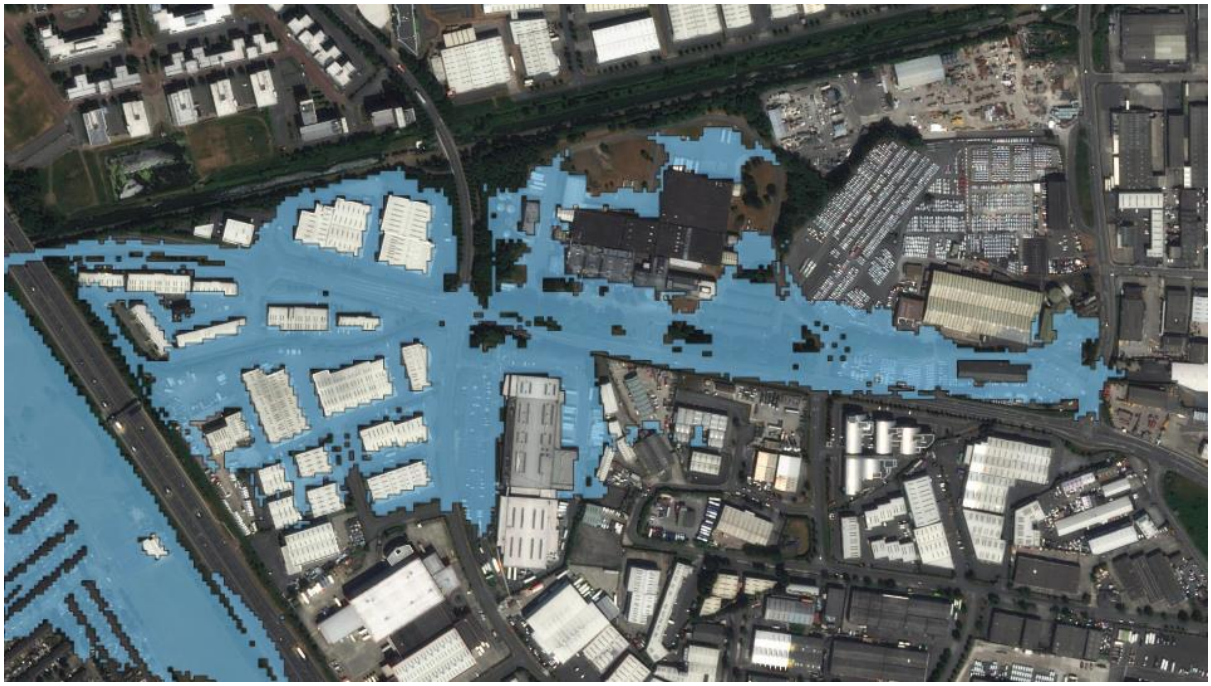


Figure 5-6: Flood Zone B with 30% climate change uplifting factor

Figure 5-7: Flood Zone C with 30% climate change uplifting factor

The flood maps are consistent with past flooding of this section of the Camac. This portion of the Camac Catchment is susceptible to pluvial flooding from intense rainfall event.

The flood extents indicate flow paths generally coming directly out of the river channel.

5.2.2 Camac Section 2 - Naas Road to Blackhorse LUAS Stop

There are four sections where the river channel is open; but the river is basically a heavily modified water body and has been designated as such in the River Basin Management Plan. This river section passes through several industrial estates and then flows through Lansdowne Valley Park. Robinhood Stream, Gallanstown Stream, Ballymount Stream, Drimnagh Castle Stream, and Walkinstown Stream all discharge to the River Camac in this section.

The site does not benefit from formal defences and all informal defences have been omitted in the flood mapping. The CFRAM Study for the Camac did not reveal any overall flood alleviation scheme for the catchment, except for flood awareness and flood warning systems.

Present day Flood Zones B, and C (no Flood Zone A present) are provided in Figure 5-8 and Figure 5-9.

Figure 5-8: Flood Zone B – Naas Road and John F. Kennedy Drive

Figure 5-9: Flood Zone C - Naas Road, John F. Kennedy Drive, John F. Kennedy Industrial Estate, Kylemore Road, and South of Bluebell Avenue

Sensitivity to climate change of the Camac Section 2 is moderate to high. There are some parts of Camac Section 2 indicating climate change is likely to give an increase in risk (see Figure 5-10 toFigure 5-12).

Figure 5-10: Flood Zone A with 30% climate change uplifting factor

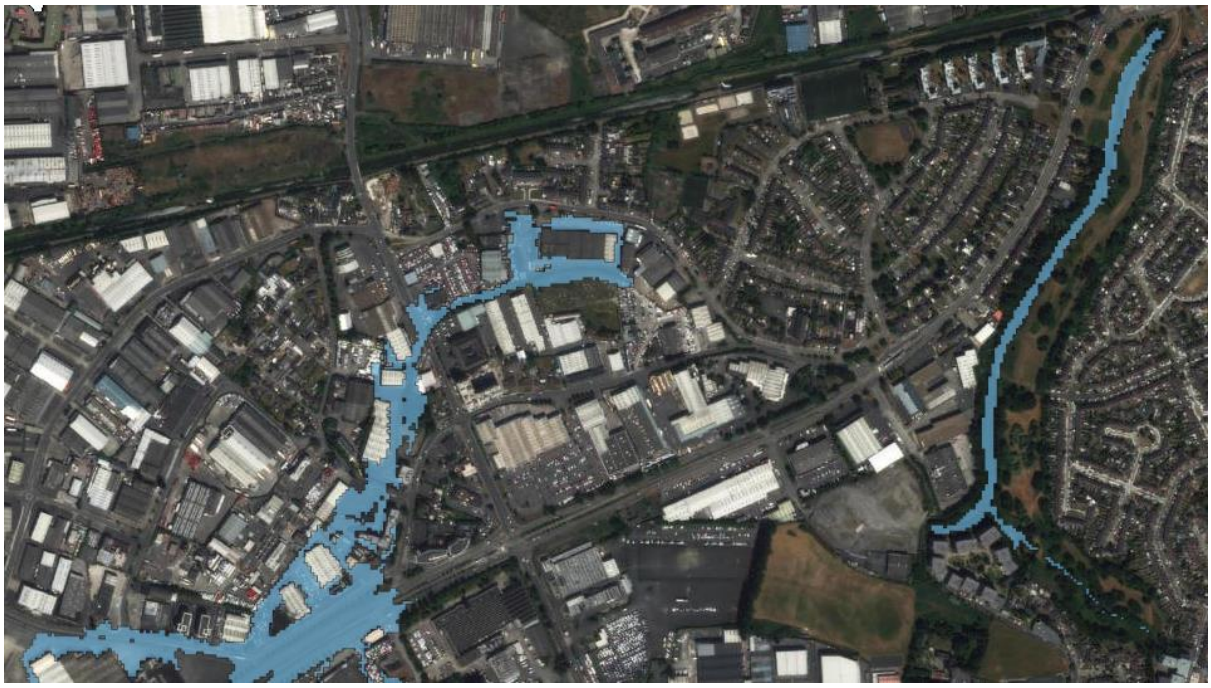


Figure 5-11: Flood Zone B with 30% climate change uplifting factor

Figure 5-12: Flood Zone C with 30% climate change uplifting factor

The flood maps are consistent with past flooding of this section of the Camac. This portion of the Camac Catchment is susceptible to pluvial flooding from intense rainfall event.

The flood extents indicate flow paths generally coming directly out of the river channel.

5.2.3 Camac Section 3 – Tributaries

Camac tributaries (Robinhood, Ballymount, and Walkinstown Streams) are mainly open in this area. These streams pass through the industrial estate and then flows through the Naas Road.

The site does not benefit from formal defences and all informal defences have been omitted in the flood mapping. The CFRAM Study for the Camac did not reveal any overall flood alleviation scheme for the catchment, except for flood awareness and flood warning systems.

Present day Flood Zones A, B, and C are provided in Figure 5-13 to Figure 5-15.

Figure 5-13: Flood Zone A – Robinhood Industrial Estate and Robinhood Road

Figure 5-14: Flood Zone B – Robinhood Industrial Estate and Robinhood Road

Figure 5-15: Flood Zone C – Robinhood Industrial Estate and Robinhood Road

Sensitivity to climate change of the Camac Section 3 is moderate to high. There are some parts of Camac Section 3 indicating climate change is likely to give an increase in risk (see Figure 5-16 to Figure 5-18).

Figure 5-16: Flood Zone A with 30% climate change uplifting factor

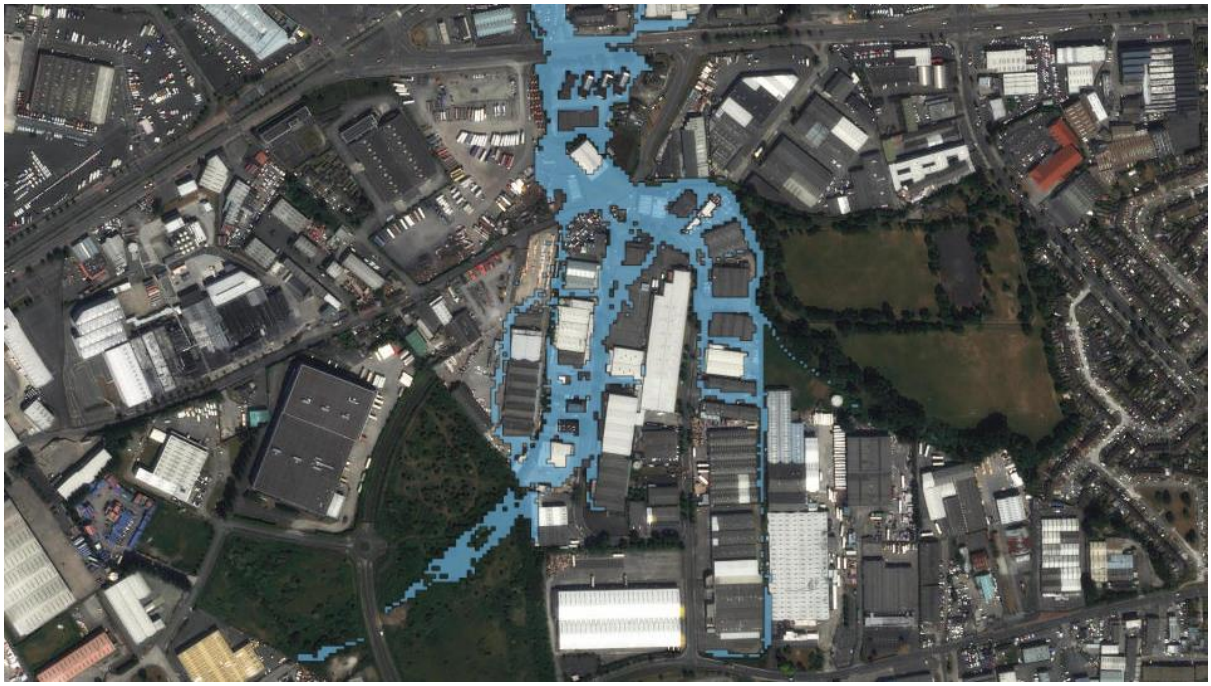


Figure 5-17: Flood Zone B with 30% climate change uplifting factor

Figure 5-18: Flood Zone C with 30% climate change uplifting factor

The flood maps are consistent with past flooding of this section of the Camac. This portion of the Camac Catchment is susceptible to pluvial flooding from intense rainfall event.

5.3 Justification Test

The findings from this SFRA have been integrated into SEA Screening of the Strategic Framework. With consideration of the Sequential Approach as outlined in Figure 3.1 of "The Planning System and Flood Risk Management - 2009" and the Justification Test ensures that the development is being considered for strategic reasons.

- **The urban settlement is targeted for growth under the National Spatial Strategy (superseded by National Planning Framework), regional planning guidelines (superseded by Regional Spatial and Economic Strategy), statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act, 2000, as amended.**

  Justified - City Edge is in an area identified for compact growth under the National Planning Framework (NPF) and Regional Spatial and Economic Strategy (RSE)S and within a strategic development corridor where a short to medium term capacity for approx. 64,000 additional people has been identified. The Strategic Framework seeks to bring people, employment, and services closer together to create a series of co-benefits including better quality of life, less congestion, reduced commuting distances, more regard to the quality of the environment and amenities. This will achieve compact growth focussed on public transport links as sought by national and regional planning policy and as reflected in the respective development plans.

- **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:**

  i. ***Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement***

  City Edge lands are already zoned for development under the SDCC and DCC Development Plans and the Strategic Framework sets out a direction of travel for their urban regeneration. Some of the lands within Flood Zone A and most of the lands in Flood Zone B are already built-up. These areas are identified in the Strategic Framework as local centres with high street activity (Camac Section 1 and Section 3) and major urban centre (Camac Section 2) in the project area.

  ii. ***Comprises significant previously developed and/or under-utilised lands***

  Some of the lands within Flood Zone A and most of the lands in Flood Zone B are already built-up.

iii. Is within or adjoining the core of an established or designated urban settlement

City Edge Area is designated within the RSES's South Western Development Corridor for urban consolidation and capacity is also identified for urban development under the core strategies contained in the SDCC and DCC Development Plans.

iv. Will be essential in achieving compact and sustainable urban growth

This area is essential in achieving the compact and sustainable growth of the project area as per its identification within the Dublin MASP under the RSES and the award of URDF funding.

v. 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

Strategic proposal of land use indicates there are no suitable alternative strategic brownfield lands for the particular uses or development type in areas at lower risk of flooding, within or adjoining the urban settlement particularly within the context that lands around the City Edge Lands are largely built up with the exception of parklands.

- **Strategic Flood Risk Assessment for Flood Zones A and B has been carried out as a part of The Framework**

Existing sources of flood information including PRFA and CFRAMS flooding have been reviewed and flood zoning has been prepared for the county as per The Guidelines. Management of flood risk shall be undertaken in accordance with The Guidelines and the policies outlined in this document. Further flood risk assessment will be carried out as part of a statutory plan that will follow the non-statutory Strategic Framework and will advise whether a further Stage 2 Initial Flood Risk Assessment would be sufficient. A Site-Specific Flood Risk Assessment of appropriate detail should accompany any applications that comes forward for development in advance of a statutory plan. Such flood risk assessments should consider:

i. The FRAs should examine residual risks and ensure development does not block flow paths and does increase flood risk elsewhere.

ii. The sequential approach should be applied through site planning and should avoid encroachment onto, or loss of, the floodplain.

iii. Compensatory storage for development that results in a loss of floodplain must be provided.

iv. FRAs should implement SuDS to address surface water management issues.

6 FLOOD RISK ASSESSMENT GUIDANCE

6.1 Overview

This non statutory strategic framework provides a direction of travel for development and will inform a statutory plan that will follow. The guidance in this document may be applied should any applications for development come forward in advance of a statutory plan.

Developers and local authority planners need to consider flood risk to and from the development as part of planning proposals. To assess and demonstrate that the proposed development will not be at risk of flooding or increase flood risk elsewhere for all flood sources, a site-specific FRA and/or drainage strategy may be required. Development proposals should also aim to reduce local flood risk where possible through the implementation of SuDS and other water management measures. These key principles need to be applied at site level for development proposals and site allocations.

6.2 Developer Guidance – Flood Risk Assessment

Flood risk assessment requirements and steps to be taken by developers are summarized as follows:

1. Site Details

1.1. Information detailing the proposed development, including location, type of development, flood risk vulnerability classification, number of units and total site area

1.2. Information on the expected lifetime of the proposed development

1.3. Information demonstrating that all forms of flooding, as discussed in this SFRA, were also analysed as part of the location suitability assessment of the site

1.4. Details on the site's existing surface water drainage arrangements

2. Flood Risks and Climate Change

2.1. Details on the Flood Risk Zone in which the site is located

2.2. An analysis of all sources of flooding which could affect the site, with information provided on how flooding from these sources may occur

2.3. Details of the probability of flooding occurring on site from all flood risk sources

2.4. Information on the predicted depth and level for the design flood level for all relevant sources of flood risk

2.5. Details on how climate change is likely to alter flood risk at the site

3. Development Proposal Details

3.1. Full information on the site changes that will occur as a result of the proposed development, including hard-standing areas, landscaping and the nature of site usage

3.2. Details of the overall number of occupants and / or people accessing the building or site, compared with the current use

3.3. Evidence demonstrating that basements have been designed with internal access and egress to a higher floor above the design flood level

3.4. Design plans showing floor levels relative to predicted flood depths

4. Flood Risk Management

4.1. information on the greenfield, existing, and proposed surface water flow rates, volumes and routes generated on site

4.2. Full information on the SuDS measures and management techniques proposed to protect the building(s) and site from flooding, factoring in the potential impacts of climate change

4.3. Evidence demonstrating that the proposed flood mitigation measures will not increase flood risk outside of the development site

4.4. Evidence demonstrating that the proposed methods will reduce flood risk at the site

4.5. Evidence demonstrating that there will be no net loss of floodplain storage for all proposed developments

4.6. Full information on the flood warning / alert and emergency plan designed for the proposed site, including egress and access, evacuation plans, and mitigation measures

4.7. information on the proposed resistance and / or resilience method(s) to address predicted flood depths

5. Residual Risks

5.1. Information on the flood related risks that will remain once the proposed flood mitigation measures have been implemented

5.2. Details of how the risks will be managed over the development's lifetime, providing information on flood resilient designs and emergency planning

6.3 Developer Guidance – Drainage Strategy

Developers may need to demonstrate how surface water runoff generated by the development site will be managed. This may be demonstrated through a drainage strategy, a report that should demonstrate how surface water could affect a site of interest and the surrounding areas.

The requirements of drainage strategy are as follows:

1. Site Details and Surveys

1.1. Information detailing the proposed development, including location, type of development, flood risk vulnerability classification, number of units and total site area

1.2. Information on the current site layout, existing drainage system and catchment area(s)

1.3. Topographical site information

1.4. Ground investigation details, providing details on geology, hydrogeology, infiltration rate(s), local groundwater level(s) and potential for site contamination

1.5. Information on local drainage systems, including sewer network, watercourses, and waterbodies

1.6. Details of drainage catchment area

2. Plans

2.1. A detailed master plan of the site

2.2. A detailed network diagram for the proposed scheme, demonstrating the location and dimension of every element of the proposed drainage system. This includes labelled details of the sizes (diameter, length dimensions), gradients and locations of the systems pipes and SuDS measures

2.3. Detailed drawing(s) demonstrating the existing and proposed site sections and levels

2.4. Proposed landscaping with details of vegetative drainage (e.g., rain gardens, green roofs), if applicable

2.5. Details of the storage capacity volumes for the proposed SuDS measures, including size and dimensions

2.6. SuDS and drainage strategy maintenance plan for each drainage component following construction for the lifetime of the development (including maintenance action, maintenance frequency, access arrangements and owner responsible)

2.7. A health and safety plan for the proposed development, if appropriate

3. Calculations and Assessments

3.1. Full calculations demonstrating the peak discharge rates for greenfield conditions and the proposed site, assessing the 1 in 1 year, 1 in 30 year, 1 in 100 year and 1 in 100 year plus climate change storm events

3.2. Full calculations for 1 in 100 year and 1 in 100 plus climate change, 6-hour storm events demonstrating that the runoff volume from the proposed development can be constrained to the greenfield runoff volume

3.3. Full design assessments with supporting calculations demonstrating that the proposed drainage strategy can contain a 1 in 30-year storm event without any flooding occurring

3.4. Full design assessments with supporting calculations demonstrating that the proposed drainage strategy ensures that no building (including basements) or utility structure is flooded during a 1 in 100 year and 1 in 100 plus climate change storm event

3.5. Full design assessments demonstrating flooding in excess of 1 in 100 year plus climate change storm events are managed via exceedance flow path routes to minimise the flood risk posed to people and properties

3.6. Details of the SuDS measures identified to be implemented

3.7. Details of the attenuation storage volumes required for the proposed site for the different analysed storm events

3.8. Assessment of SuDS infiltration techniques through site specific infiltration testing

3.9. Temporary drainage requirements or discharge points during construction, providing details of pollution prevention measures if required

4. Additional Information

4.1. Points of discharge information for the surface water runoff from the site, with details of the discharge capacity across the site and details of the connections to watercourses and / or sewers where appropriate

4.2. Information on discharge rate restriction methods, if appropriate

6.4 Sustainable Drainage Systems (SuDS)

6.4.1 References

The following documents should be referred to when implementing any SuDS proposals within the project area.

- The SuDS Manual C753, CIRIA, 2015.
- GDSDS Regional Drainage Policies Vol 2: New Development, GDSDS, 2005.
- Drainage Design For National Road Schemes - Sustainable Drainage Options, TII (Transport Infrastructure Ireland), 2014.
- Dublin City Council's SuDS policy Drainage Requirements for Planning Applications | Dublin City Council
- SuDS in London – a guide, TfL, 2016.
- South Dublin County Council guidance available at

  https://www.sdcc.ie/en/services/planning/planning-applications/water-and-drainage-considerations/

6.4.2 Description

Sustainable Drainage Systems (SuDS) incorporate a range of measures and management techniques designed to manage surface water runoff. They are designed to mimic natural drainage as closely as possible, providing an alternative to 'hard engineered' traditional drainage. They provide opportunities to:

- Reduce the causes and impacts of flooding, providing opportunities to reduce the overall local flood risk.
- Minimise pollution from urban runoff at source.
- Enable groundwater recharge where infiltration is possible.
- Combine water management with green space, providing environmental, amenity and recreational benefits.

All new developments should incorporate SuDS unless there are practical and justifiable reasons for why they are not appropriate.

The SuDS measures should aim to achieve greenfield runoff rates, providing management and attenuation features that ensure that surface water runoff is managed as close to the source as possible. Greenfield runoff conditions must be achieved for any greenfield sites. Development on current brownfield sites should also aim to achieve greenfield runoff rates where practical.

The investigation needs to demonstrate the SuDS measures that the development will include and demonstrate how they connect with any piped drainage system required if infiltration is not possible.

Equally, there are opportunities within the project area to retrofit SuDS. This would be mainly targeted on large impermeable areas but also within the public realm.

7 POLICY RECOMMENDATIONS

7.1 Overview

Future developments and climate change are some of the key factors that are increasing the risk of flooding events across Ireland and globally. Several key drivers, including urban development expansion, could see an increase in flood risk from various sources. For example, increased foul drainage from an increased local population places a greater pressure on the local sewer system. This has the potential to increase the risk of sewer flooding, especially in areas with combined sewers which drain foul and surface water. A decrease in permeable ground cover due to urban development may increase the risk of surface water and ordinary watercourse flooding.

The pressure of accommodating more developments may mean a larger number of developments being proposed for sites within higher risk Flood Zone areas, placing them at greater risk of flooding. The impact of development and projected future population growth may not only have an impact on the flood risk presented by different flood sources but present a greater overall flood risk to people and properties due to the accumulative risk from each source. To meet flood risk mitigation requirements whilst facilitating housing and employment development needs, local policy targeting the impact of future growth on flood risk is required.

7.2 Recommended Policies and Guidance

This section builds on the findings presented throughout the SFRA and provides recommendations that each Council can adopt as part of their flood risk planning policies in addition to the Strategic Framework's approach to flooding, SUDS and natural Infrastructure. These recommendations are split into two groups as managing flood risks and managing surface water. The recommendations in relation to development is set out to provide some guidance should any applications for development come forward in advance of a statutory plan.

7.2.1 Managing Flood Risks

- Councils and developers should comply with *The Planning System and Flood Risk Management Guidelines.*
- An integrated surface water management strategy supported by detailed flood risk modelling should be developed to inform the Strategic Framework and to service the new developments.
- The indicative surface water discharge rates considering the effects of climate change should be included in the Surface Water Management Plan.
- Developers must submit a site-specific Flood Risk Assessment at the planning application stage.

- Existing open watercourses should be retained with maintaining an appropriate riparian zone.

7.2.2 Managing Surface Water

- Councils and developers should comply with surface water requirements of *Greater Dublin Strategic Drainage Strategy* (GDSDS).
- An integrated surface water management strategy should be developed to ensure that all necessary public surface water infrastructure is in place to service new developments.
- Councils should consider implementation of further surface water flood risk mitigation requirements for any proposed developments within high flooding risk areas.
- Councils and developers should incorporate SuDS measures into any public realm, street network and within public open spaces.
- Developers should aim to achieve greenfield runoff rates via their proposed SuDS measures and ensure that surface water runoff is managed as close to the source as possible.
- Developments should maximise the use of open spaces to ensure spaces for water to flow during times of flood.
- Developers should aim to incorporate permeable paving in hardstanding areas to provide flood mitigation benefits in new developments.
- A green infrastructure strategy should be developed at Statutory Plan stage.
- Councils should investigate the opportunities to naturalise the River Camac and its tributaries.

8 REVIEW AND UPDATE

8.1 Overview

Information in relation to flood risk will be monitored, reviewed and this SFRA will be at Statutory Plan stage. There are a number of key outputs from possible future studies and datasets which could inform any update of the FRA as availability allows. A list of potential sources of information which will contribute to a revised SFRA, and statutory plan is provided in Table 8-1.

Table 8-1: Potential sources of information on flood risk

Data	Source
Preliminary flood risk maps (Including pluvial and groundwater)	OPW (under the Floods Directive)
CFRAM Studies a) Preliminary Flood Risk Assessment b) Production of the flood maps c) Production of Flood Risk Management Plans	OPW
Flood maps of other sources, such as canal breach and drainage networks	Various
Significant flood events	Various
Changes to Planning and / or Flood Management Policy	DoEHLG OPW Dublin City Council South Dublin County Council
SFRAs for Town Plans	Dublin City Council South Dublin County Council
Detailed FRAs	Various
Flood Defence Feasibility / Design Reports	OPW (Primarily)

8.2 Review & Update – Technical Content

A SFRA is a live document which is to be used to assist in allocating sites for future development and general decision making at Statutory Plan stage. It is essential that the data contained within the SFRA is updated as much as possible at statutory plan stage to ensure that decisions are made on the best information available.

8.3 Review & Update – Mapping

The knowledge of flood risk is constantly changing and improving and any revised SFRA should reflect this. Not only could such enhanced knowledge highlight risk areas which were not previously at risk, it could also free up areas which may have been at risk but are no longer considered to be so. This could free up land for potential future development.

APPENDIX A - FLUVIAL FLOODING MAPS

Project_Boundary
10% AEP Fluvial Flood Extent - Present
Buildings

Comhairle Cathrach Bhaile Átha Cliath
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Comhairle Contae Átha Cliath Theas
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PROJECT No.	STAGE	REVISION
20849	STRATEGIC FRA	-

DRAWING No.
20849-SFRA001

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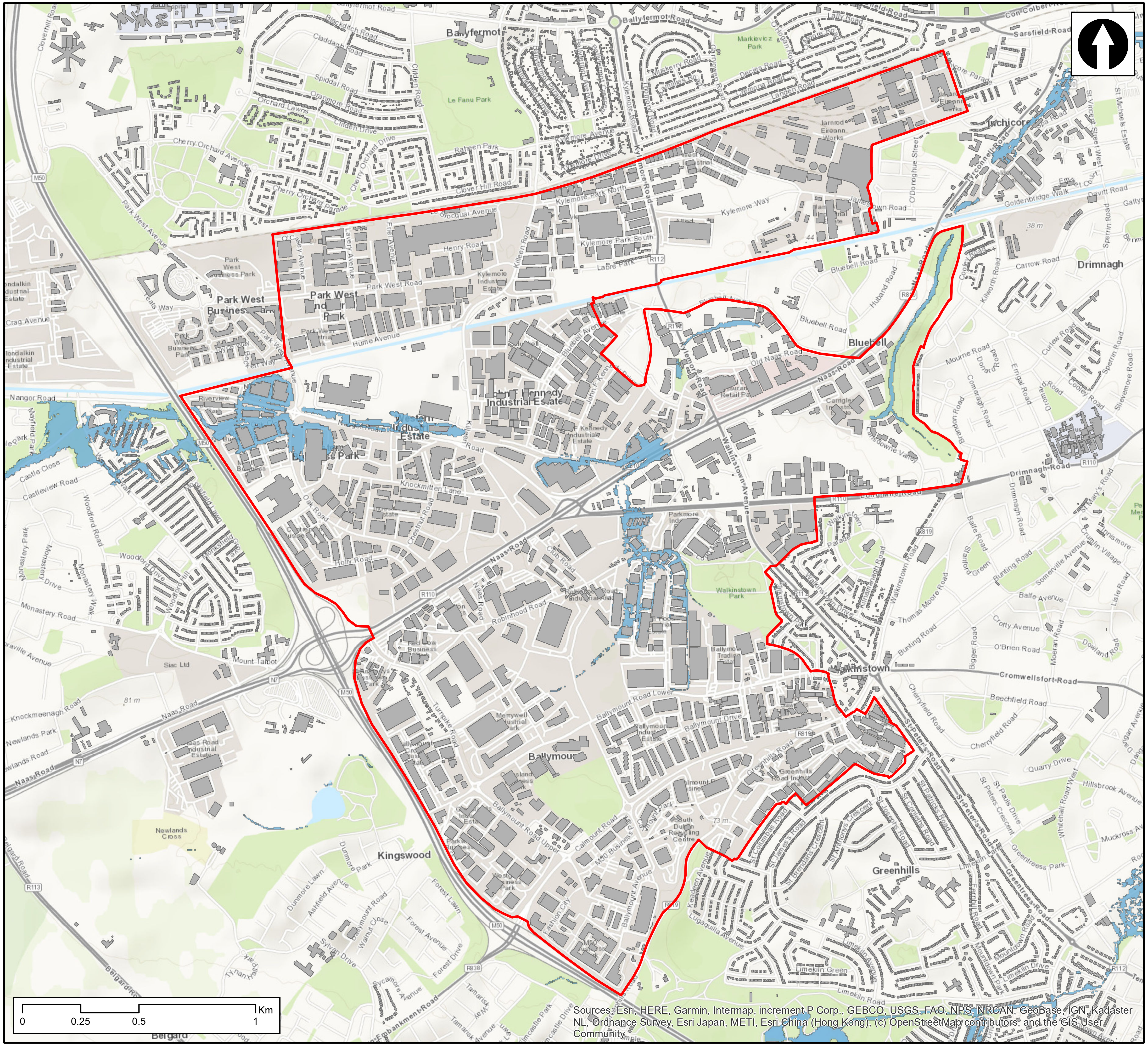

Project_Boundary

1% AEP Fluvial Flood Extent - Present

Buildings

Comhairle Cathrach Bhaile Átha Cliath Dublin City Council

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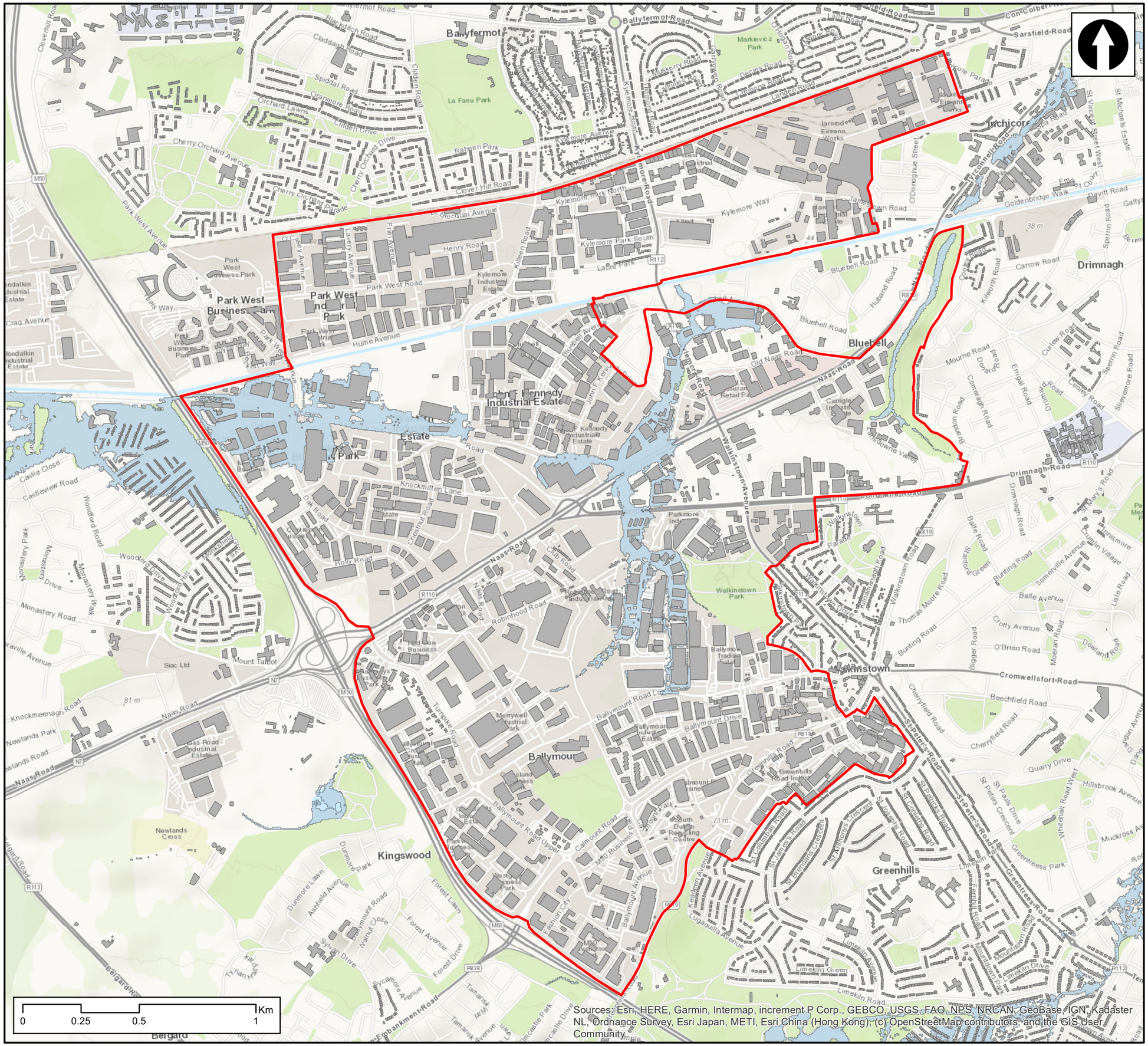
PROJECT No	STAGE
20849	STRATEGIC FRA

DRAWING No.	REVISION
20849-SFRA002	-



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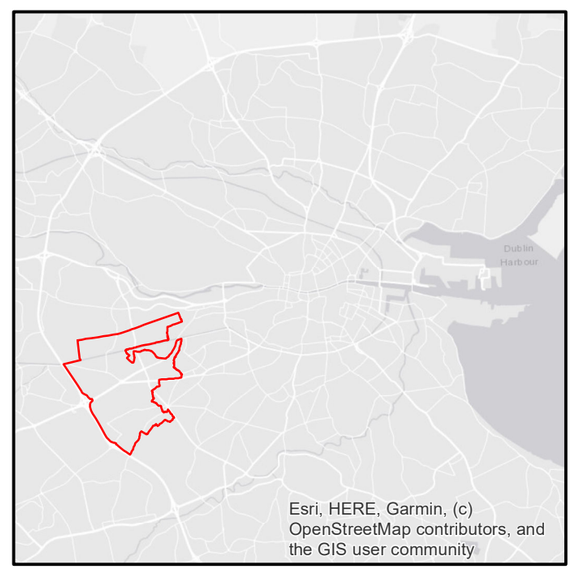
PROJECT No.	STAGE	REVISION
20849	STRATEGIC FRA	
DRAWING No.		
20849-SFRA003		-



Project_Boundary
10% AEP Fluvial Flood Extent (30% Uplift)
Buildings

Comhairle Cathrach Bhaile Átha Cliath
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PROJECT No.	STAGE	REVISION
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DRAWING No.
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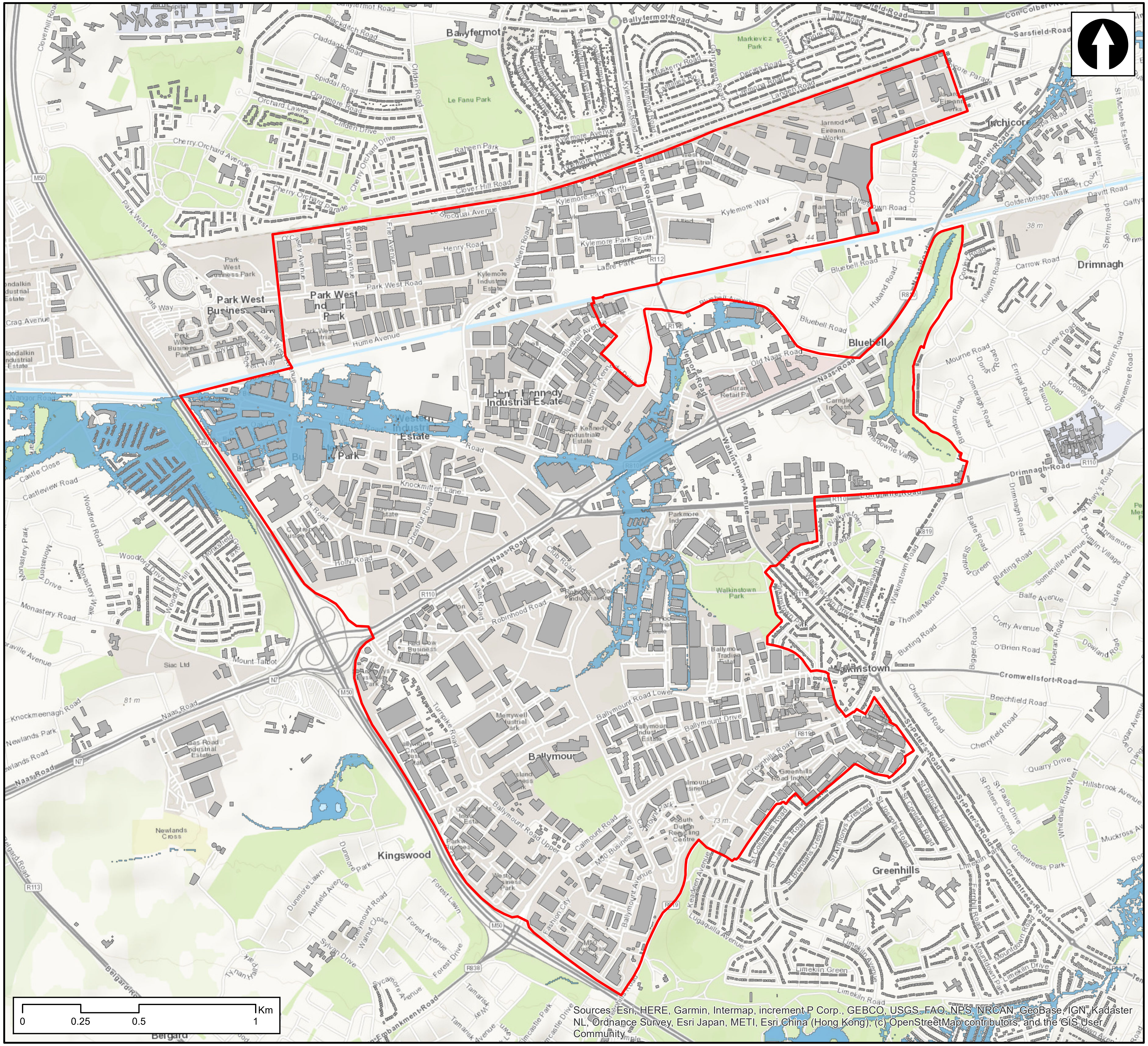

Project_Boundary

1% AEP Fluvial Flood Extent (30% Uplift)

Buildings

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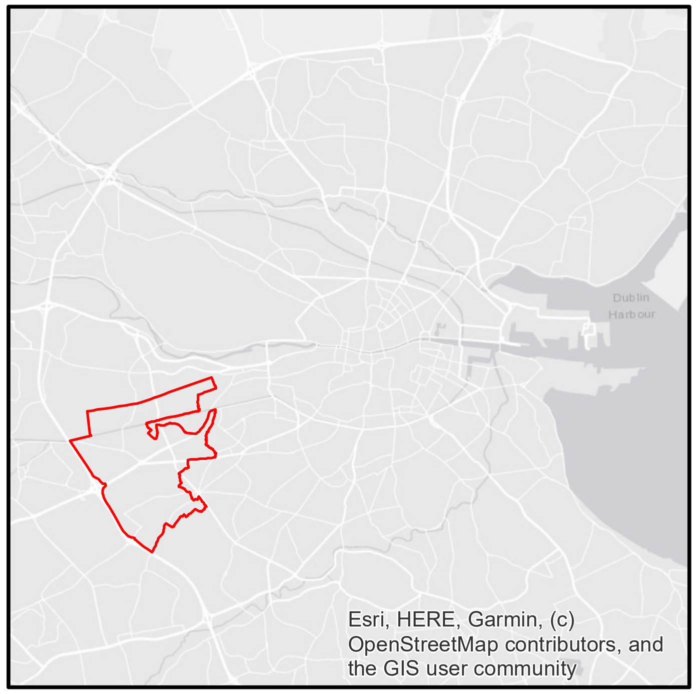

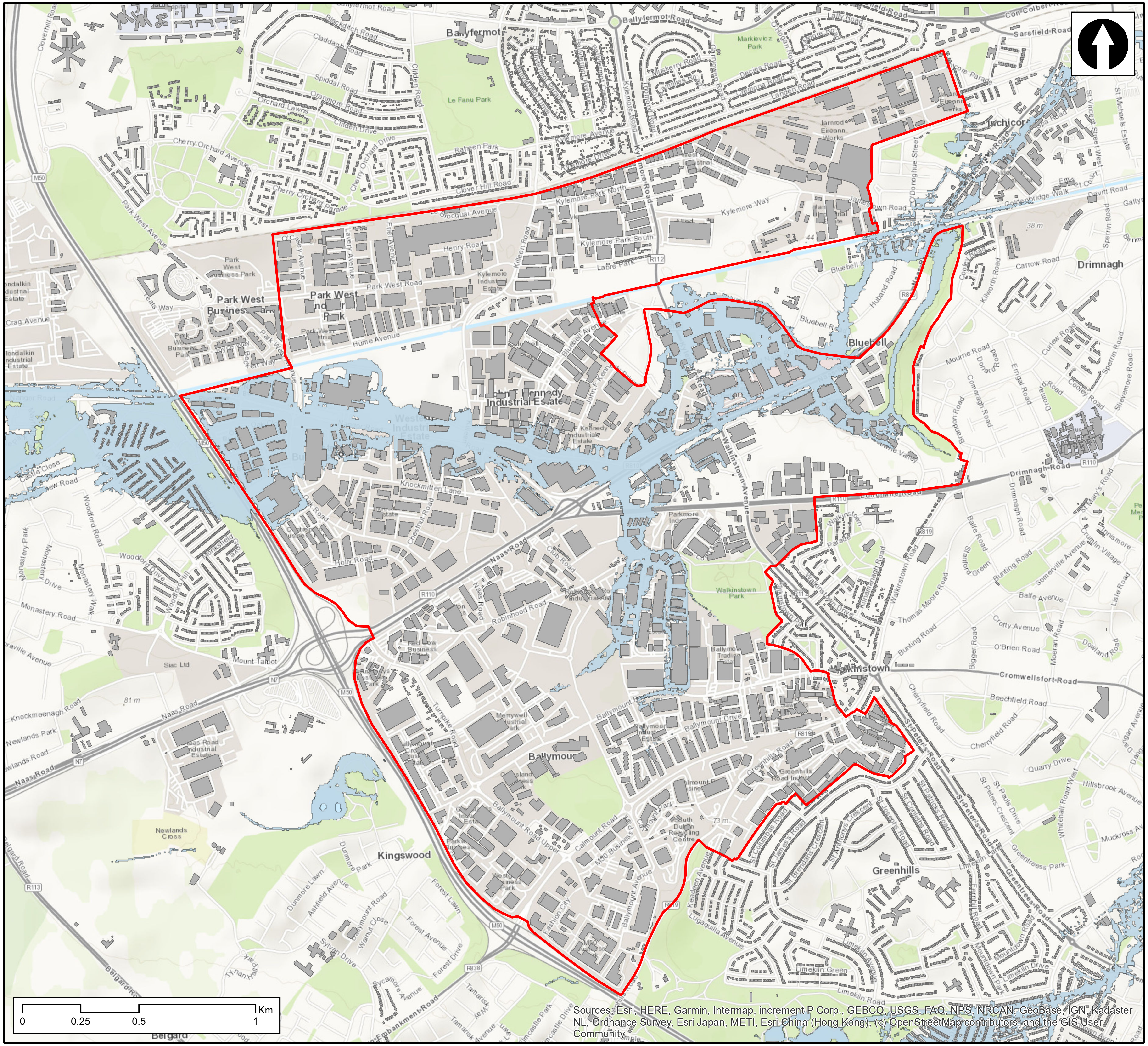

Project_Boundary
0.1% AEP Fluvial Flood Extent (30% Uplift)
Buildings

Comhairle Cathrach Bhaile Átha Cliath
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PROJECT No	STAGE
20849	STRATEGIC FRA

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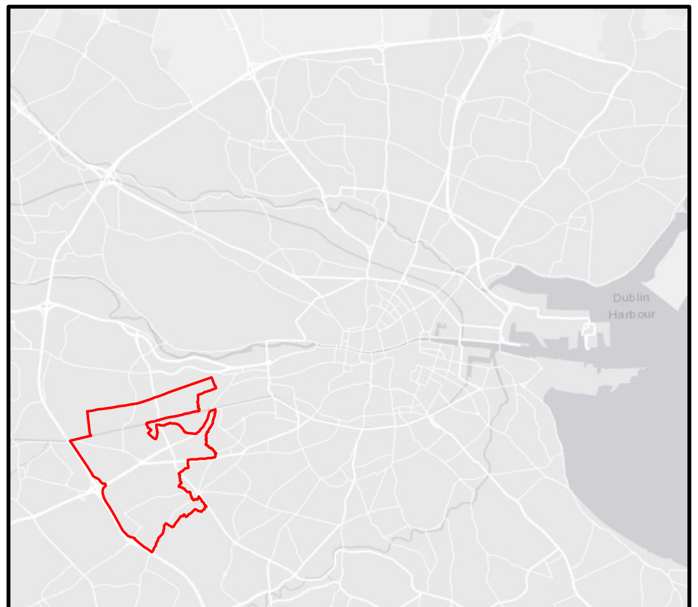

APPENDIX B - PLUVIAL FLOODING MAPS

Project_Boundary

1% AEP Pluvial Flood Extent - Present

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PROJECT No.	STAGE
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DRAWING No.	REVISION
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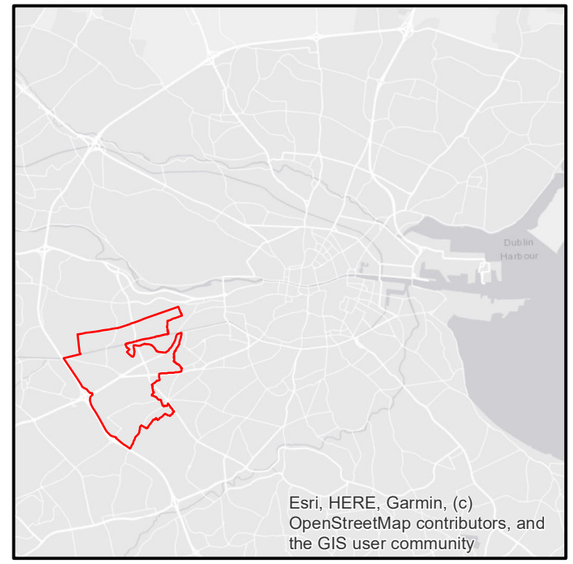

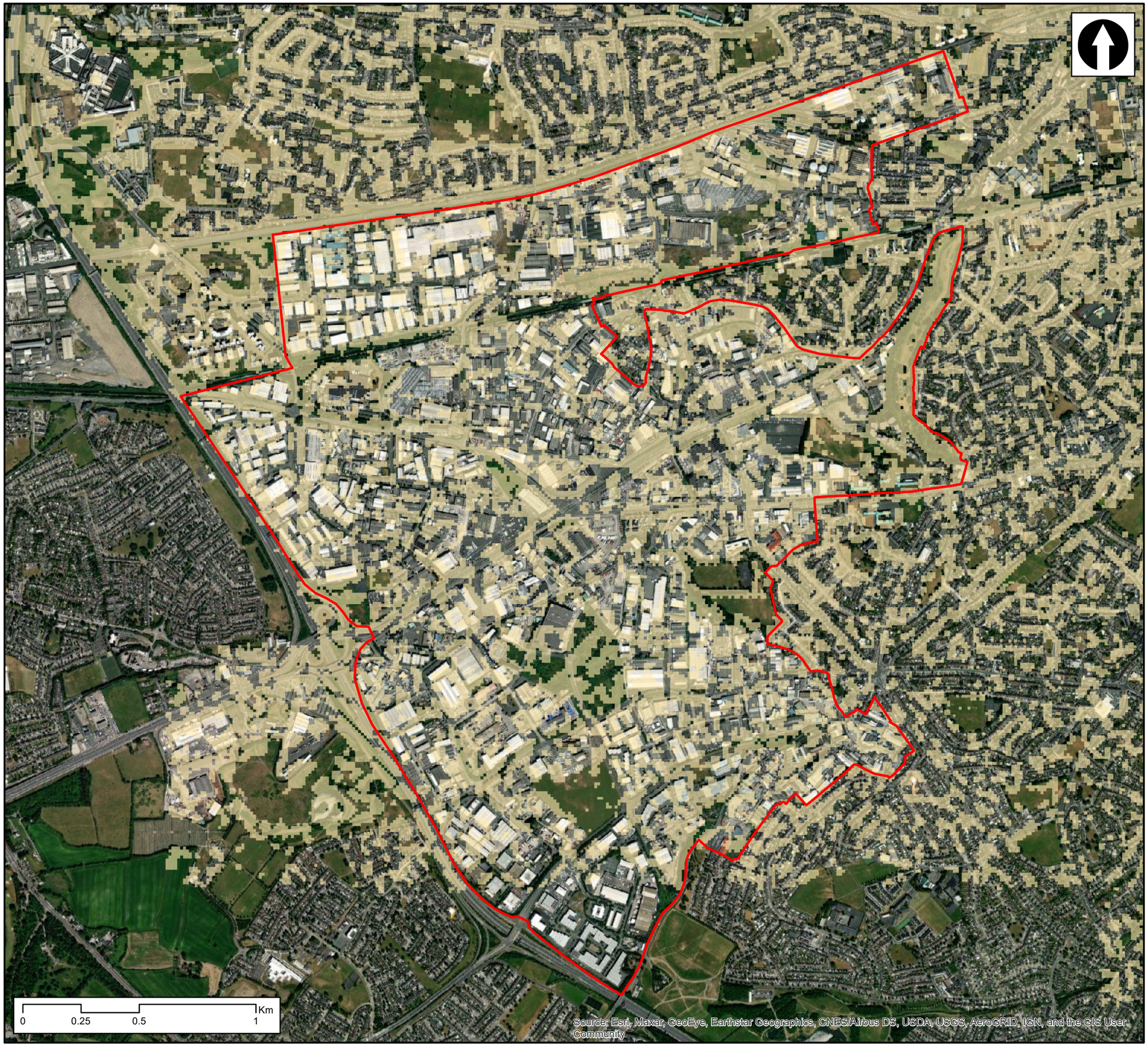

Project_Boundary

0.5% AEP Pluvial Flood Extent - Present

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PROJECT No.	STAGE
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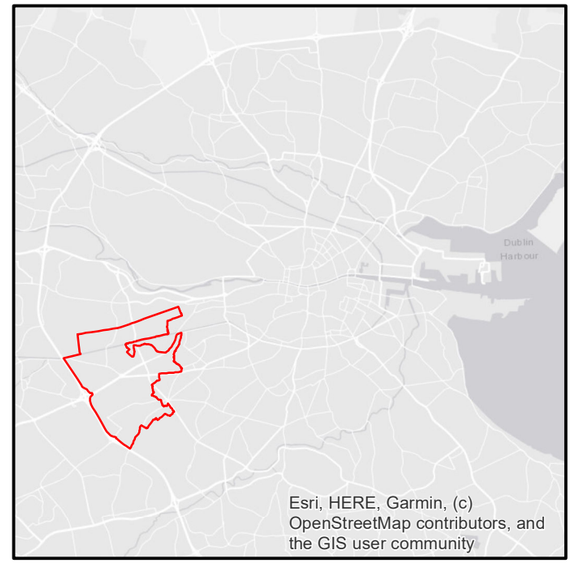
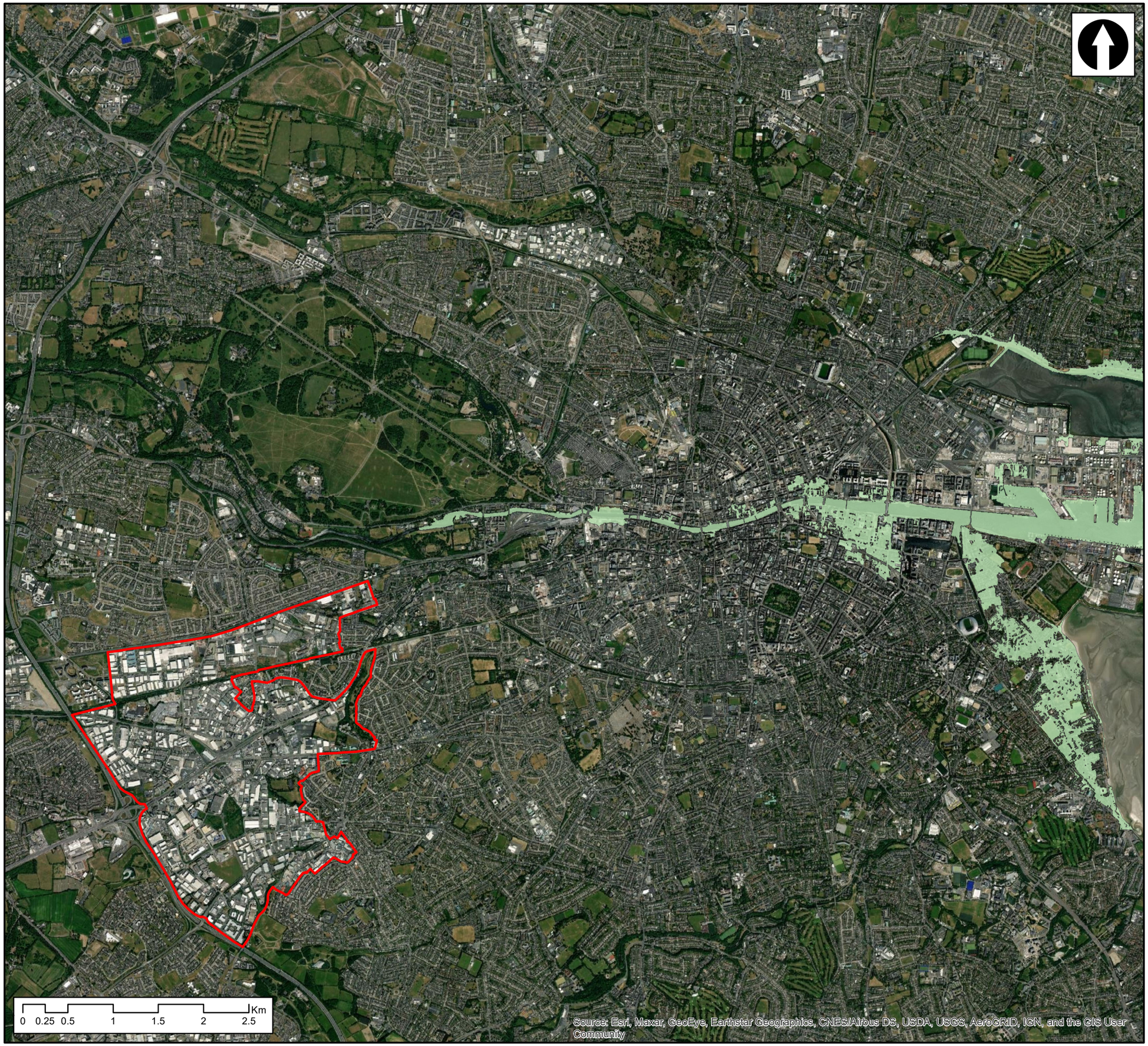
DRAWING No.	REVISION
20849-SFRA012	-



APPENDIX C - COASTAL FLOODING MAPS



Project_Boundary

0.1% AEP Coastal Flood Extent - Present

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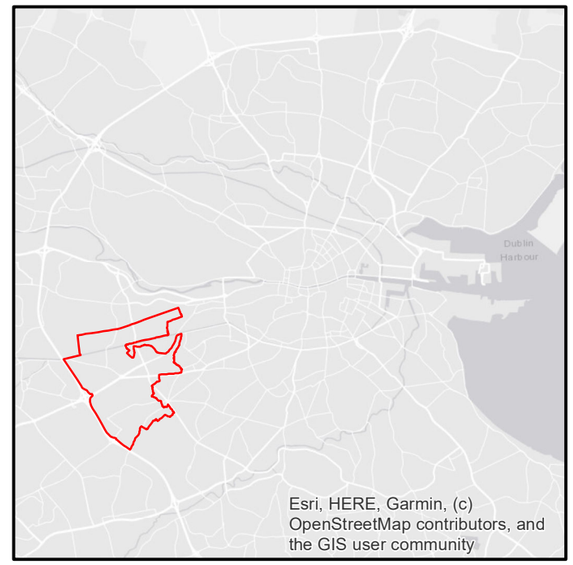
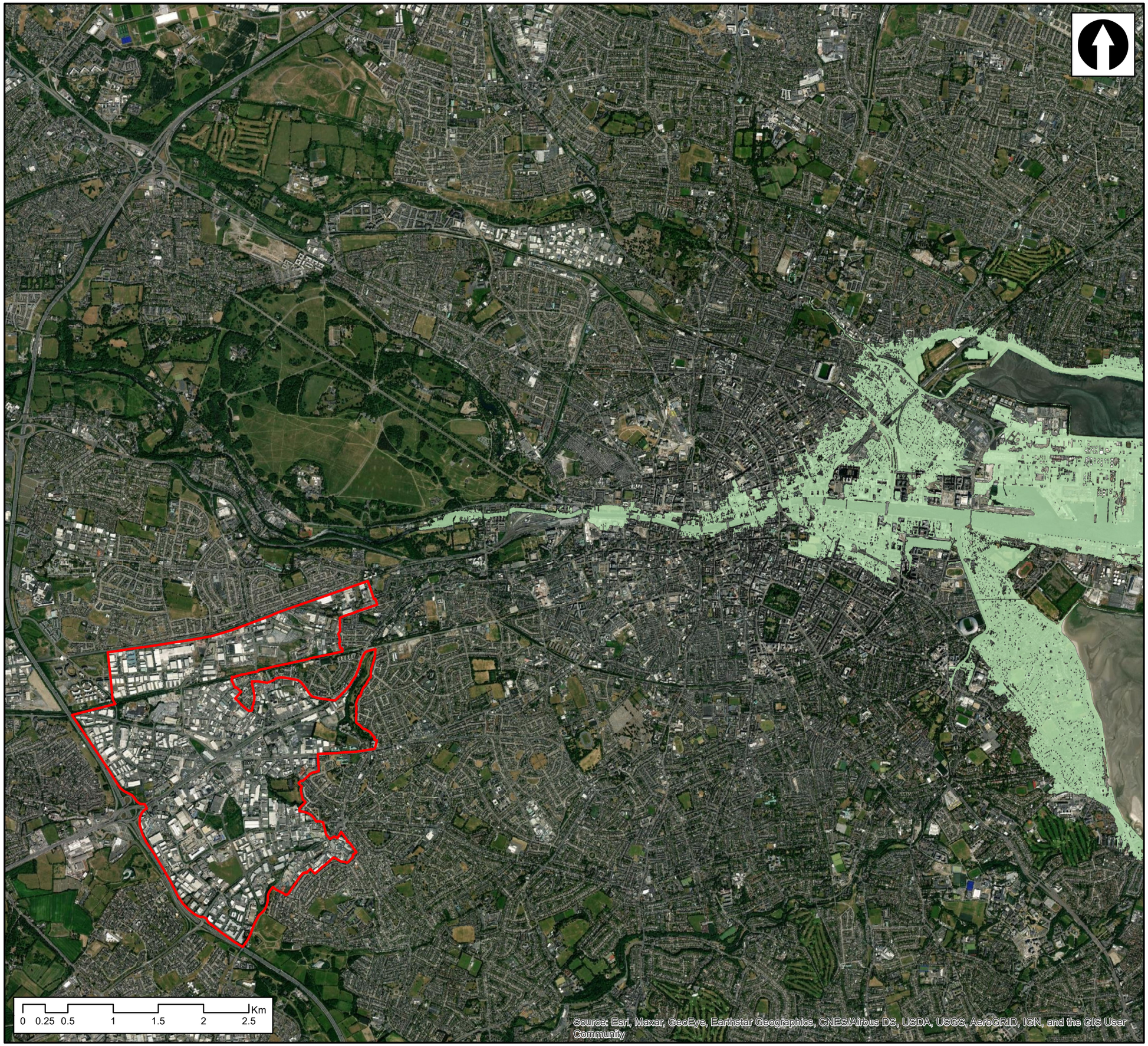
PROJECT No.	STAGE
20849	STRATEGIC FRA

DRAWING No.	REVISION
20849-SFRA021	-





Project_Boundary

0.1% AEP Coastal Flood Extent (20% Uplift)

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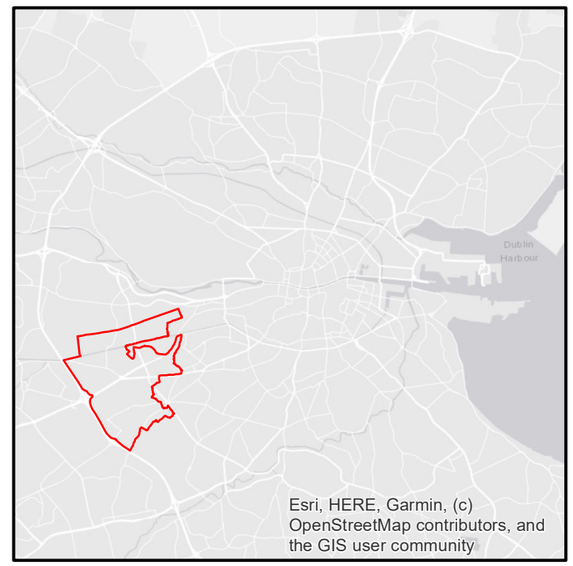
PROJECT No.	STAGE
20849	STRATEGIC FRA

DRAWING No.	REVISION
20849-SFRA022	-



Project_Boundary

0.1% AEP Coastal Flood Extent (30% Uplift)

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PROJECT No.	STAGE
20849	STRATEGIC FRA

DRAWING No.	REVISION
20849-SFRA023	-

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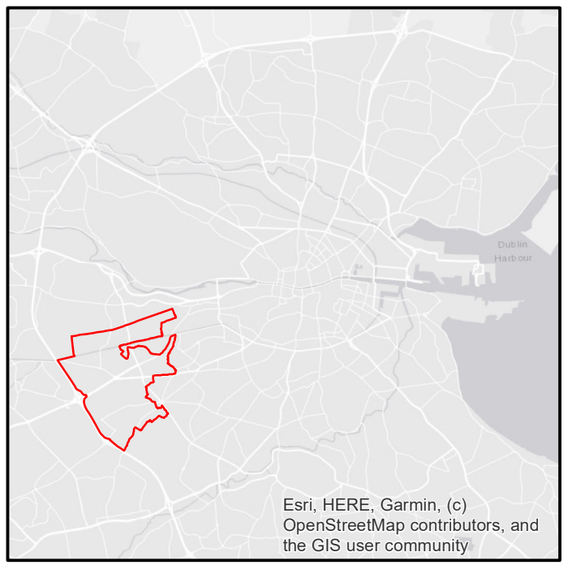
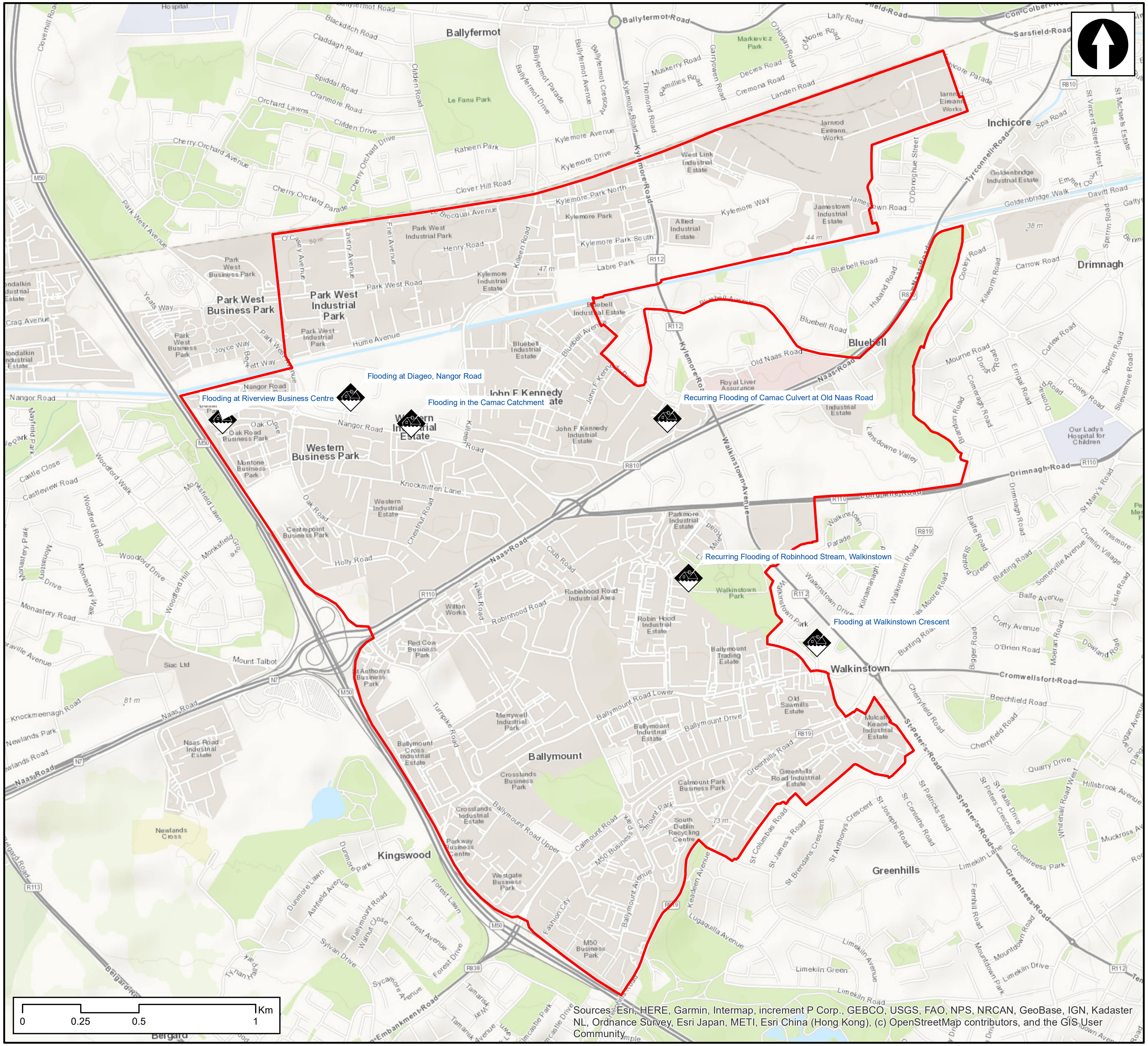


APPENDIX D - PAST FLOODS



Project_Boundary

Locations of Past Flood Events

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PROJECT No	STAGE
20849	STRATEGIC FRA

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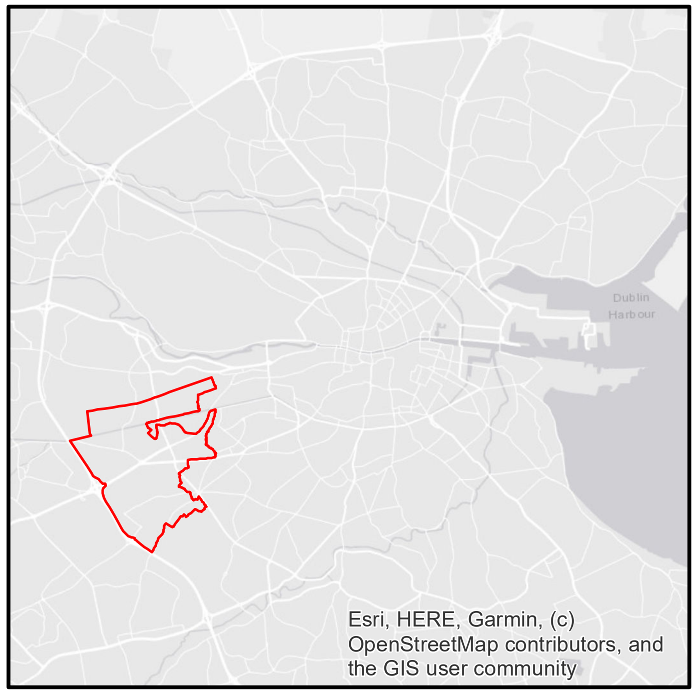
20849-SFRA031	-



APPENDIX E – RIPARIAN CORRIDOR MAPS

Project_Boundary

Riparian Corridor

Comhairle Cathrach Bhaile Átha Cliath
Dublin City Council

Comhairle Contae Átha Cliath Theas
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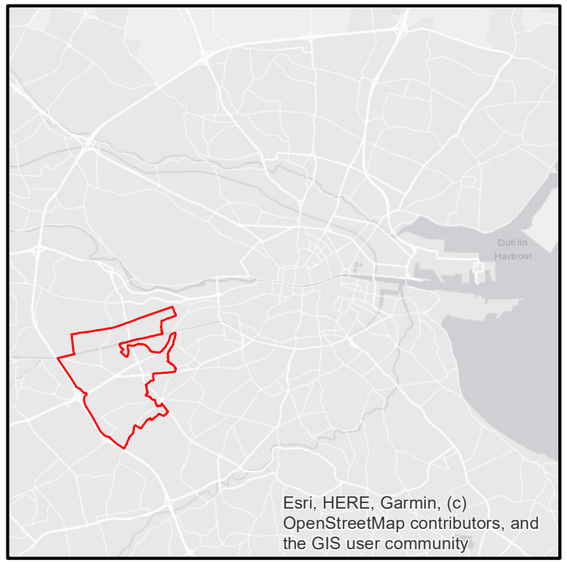

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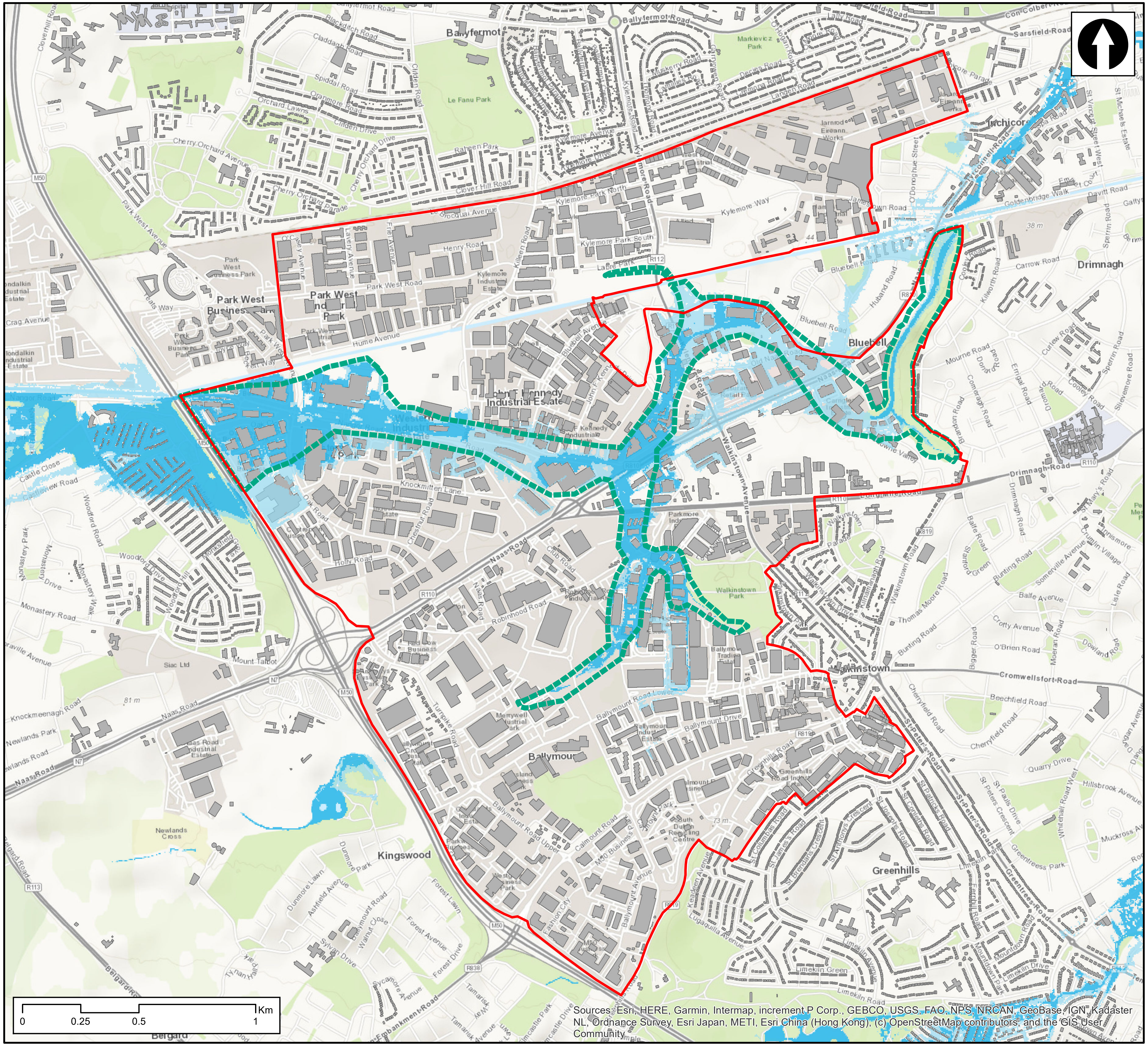

- Project_Boundary
- Riparian Corridor
- 1% AEP Flood Extent Extent (30% Uplift)
- 0.1% AEP Fluvial Flood Extent (30% Uplift)
- Buildings

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