Ruirside Developments Limited
| January 2020

42A Parkgate Street, Dublin 8

Site-Specific Flood Risk Assessment

265381-00

ARUP

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1 Introduction

1.1 Background

Arup was commissioned by Ruirside Developments Limited to prepare a Site-Specific Food Risk Assessment (FRA) for a proposed mixed-use development on 42A Parkgate Street in Dublin 8 ('the proposed development').

This report details the site-specific FRA which forms part of the planning application for the proposed development. It has been undertaken in accordance with the Guidelines for Planning Authorities on '*The Planning System and Flood Risk Management Guidelines for Planning Authorities*'[1] published in November 2009, jointly by the Office for Public Works (OPW) and the then Department of Environment, Heritage and Local Government (DEHLG).

1.2 Scope of Work

The scope of the study includes the following:

- Review of all relevant information and data from;
  - The Office of Public Works (OPW) *Preliminary Flood Risk Assessment Mapping (PFRA)*[2]*;*
  - *Eastern Catchment Flood Risk Assessment and Management (CFRAM) Study*[3]*;*
  - *The Dublin City Council Development Plan 2016 - 2022*[4]*;*
  - Any historic flood information for the area and/or any relevant studies.
- Review of available site investigation data;
- Review of the risk of coastal, fluvial, pluvial and groundwater flooding; and
- Preparation of an FRA Report.

1.3 Summary of Data Used

In preparing this report, the following data was collated and reviewed:

[1] Office of Public Works (OPW), 2009. The Planning System and Flood Risk Management Guidelines for Planning Authorities.
[2] Office of Public Works (OPW), 2018. Preliminary Flood Risk Assessment Mapping. Available at: www.cfram.ie/pfra [Accessed: March 2019]
[3] Office of Public Works (OPW), 2018. Eastern Catchment and Flood Risk Assessment Management Mapping. www.floodinfo.ie [Accessed: March 2019]
[4] Dublin City Council, 2016. Dublin City Development Plan 2016-2022. http://www.dublincity.ie/main-menu-services-planning-city-development-plan/dublin-city-development-plan-2016-2022 [Accessed: March 2019].

- Flood history of the site from the OPW National Flood Hazard Mapping website (www.floodmaps.ie)[5];
- Catchment Flood Risk Assessment and Management (CFRAM) mapping[3] produced by the OPW (www.floodinfo.ie);
- Preliminary Flood Risk Assessment (PFRA) mapping produced by the OPW (www.cfram.ie/pfra)[2];
- Site geological and hydrogeological data from the Geological Survey of Ireland website (www.gsi.ie)[6];
- Guidelines for Planning Authorities on '*The Planning System and Flood Risk Management*'[1] published in November 2009, jointly by the Office of Public Works (OPW) and the then Department of Environment, Heritage and Local Government (DEHLG); and
- Aerial photography and mapping from Bing Maps and Google Maps.

Note that all Ordnance Datum (OD) levels referred to in this report are to Malin Head Ordnance Datum.

1.4 Site Description

The site of the proposed development is located on 42A Parkgate Street, Dublin 8 as indicated in Figure 1. The site is bordered to the north by Parkgate Street, to the south by the River Liffey, to the west by the Parkgate Business Centre and to the east by both the River Liffey and Parkgate Street. The site covers an area of approximately 0.82 hectares and contains a number of low rise buildings which will be demolished as part of the proposed development. The site also consists of an area of the Parkgate Street roadway which is to be upgraded.

[5] Office of Public Works, OPW, National Flood Hazard Mapping Web Site. http://www.floodmaps.ie/ [Accessed: March 2019].
[6] Geological Survey of Ireland (GSI), 2018. Groundwater Vulnerability Mapping. Available at: www.gsi.ie

Figure 1: Site location (Source: Adapted from Bing Maps)

Existing ground levels across the site vary from approximately 3.30mOD at the southwest boundary to 5.50mOD at the northeast boundary as indicated in Figure 1. Please refer to **Appendix A** for the detailed topographical survey of the existing site which was completed by Precision Surveys in July 2018.

1.5 Proposed Development

The proposed development is a mixed-use residential and commercial scheme comprising of 'Build to Rent' residential units with associated residential amenities and facilities, commercial office and café/ restaurant floor space. A 29-storey residential tower element is the main architectural feature of the development and this is surrounded by several smaller blocks varying from 8 to 13 stories in height. A new public square will be provided, along with a public riverside walk and private amenity courtyard.

The proposed development is presented in Figure 2.

Figure 2: Schematic of the proposed development (Source: Reddy Architecture)

2 Planning Context

The following planning policy documents are relevant to the assessment of the proposed development:

- The National Planning Guidelines published by the OPW and the Department of the Environment, Heritage and Local Government in November 2009 entitled '*The Planning System and Flood Risk Management Guidelines for Planning Authorities*'[1] ; and
- The *Dublin City Council Development Plan 2016 - 2022*[4].

2.1 The Planning System and the Flood Risk Management Guidelines

2.1.1 Introduction

In November 2009, the Department of Environment, Heritage and Local Government and the Office of Public Works jointly published a Guidance Document for Planning Authorities entitled "*The Planning System and Flood Risk Management Guidelines for Planning Authorities*[1]".

The Guidelines are issued under Section 28 of the *Planning and Development Act 2000*[7]. Planning Authorities and An Bord Pleanála are therefore required to implement these Guidelines in carrying out their functions under the Planning Acts.

The aim of the Guidelines is to ensure that flood risk is neither created nor increased by inappropriate development.

The Guidelines require the planning system to avoid development in areas at risk of flooding, unless the development can be justified on wider sustainability grounds and the risk can be reduced or managed to an acceptable level.

The Guidelines require the adoption of a Sequential Approach (to Flood Risk Management) of Avoidance, Reduction, Justification and Mitigation and they require the incorporation of Flood Risk Assessment into the process of making decisions on Planning Applications and Planning Appeals.

Fundamental to the Guidelines is the introduction of flood risk zoning and the classifications of different types of development having regard to their vulnerability.

The management of flood risk is now a key element of any development proposal in an area of potential flood risk and should therefore be addressed as early as possible in the site master planning stage.

[7] Planning and Development Act 2000 (S.I. No. 30 of 2000)

2.1.2 Definition of Flood Zones

Flood Zones are geographical areas within which the likelihood of flooding is in a particular range. There are three types of flood zones defined in the Guidelines as follows:

Table 1: Flood Zones (Source: OPW Guidelines)

Flood Zone	Probability
Flood Zone A	Probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding).
Flood Zone B	Probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 year and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and
Flood Zone C	Probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

2.1.3 Definition of Vulnerability Classes

The following table summarises the Vulnerability Classes defined in the Guidelines and provides a sample of the most common type of development applicable to each.

Table 2: Vulnerability classes (Source: OPW Guidelines)

Vulnerability	Type of Development
Highly Vulnerable Development	Includes Garda, ambulance and fire stations, hospitals, schools, residential dwellings, residential institutions, essential infrastructure, such as primary transport and utilities distribution and SEVESO and IPPC sites, etc.
Less Vulnerable Development	Includes retail, leisure, warehousing, commercial, industrial and non-residential institutions, etc.
Water Compatible Development	Includes flood control infrastructure, docks, marinas, wharves, navigation facilities, water-based recreation facilities, amenity open spaces and outdoor sport and recreation facilities.

2.1.4 Types of Vulnerability Classes Appropriate to Each Zone

The following table illustrates the different types of Vulnerability Class appropriate to each Zone and indicates where a Justification Test will be required.

Table 3: Vulnerability classes for each zone (Source: OPW Guidelines)

Vulnerability Class	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable	Justification Test	Justification Test	Appropriate
Less Vulnerable	Justification Test	Appropriate	Appropriate
Water Compatible	Appropriate	Appropriate	Appropriate

2.2 The Dublin City Council Development Plan 2016-2022

The *Dublin City Development Plan 2016-2022*[4] came into effect in October 2016.

The Plan sets out policies and objectives to create a sustainable and vibrant city at the heart of the Greater Dublin Region and is a guide to how and where development will take place in the city over the years covered. The following paragraphs summarise the relevant provisions contained within the Plan which deal with Flood Risk Management.

Section 9.5.3 of the Plan deals with Flood Management and outlines the key policies and objectives of Dublin City Council in relation to flood risk.

The policies are listed as:

- **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 Councils 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, open space 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:** That 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.

- **SI17**: To require an environmental assessment of all proposed flood protection or flood alleviation works

The Objectives of Dublin City Council are listed as:

- **SIO8:** All development proposals shall carry out, to an appropriate level of detail, a Site-Specific Flood Risk Assessment (SSFRA) that shall demonstrate compliance with:
    - The Planning System and Flood Risk Management, Guidelines for Planning Authorities, Department of the Environment, Community and Local Government, November 2009, as may be revised/updated and the Strategic Flood Risk Assessment (SFRA) as prepared by this Development Plan.
    - The site-specific flood risk assessment (SSFRA) shall pay particular emphasis to residual flood risks, site-specific mitigation measures, flood-resilient design and construction, and any necessary management measures (the SFRA and Appendix B4 of the above mentioned national guidelines refer). Attention shall be given in the site-specific flood risk assessment to building design and creating a successful interface with the public realm through good design that addresses flood concerns but also maintains appealing functional streetscapes. All potential sources of flood risk must be addressed in the SSFRA.
- **SIO9:** Proposals which may be classed as 'minor development', for example small-scale infill, small extensions to houses or the rebuilding of houses or paving of front gardens to existing houses, most changes of use and small-scale extensions to existing commercial and industrial enterprises in Flood Zone A or B, should be assessed in accordance with the Guidelines for Planning Authorities on the Planning System and Flood Risk Management & Technical Appendices, November 2009 as may be revised/updated, with specific reference to Section 5.28 and in relation to the specific requirements of the Strategic Flood Risk Assessment. The policy shall be not to increase the risk of flooding and to ensure risk to the development is managed.
- **SIO10:** That recommendations and flood maps arising from the Fingal-East Meath CFRAM Study, the Dodder CFRAM Study and the Eastern CFRAM Study are taken into account in relation to the preparation of statutory plans and development proposals. This will include undertaking a review of the Strategic Flood Risk Assessment for Dublin city following the publication of the Final Eastern CFRAM Study, currently being produced by the OPW.
- **SIO11:** To work with neighbouring Local Authorities when developing cross-boundary flood management work programmes and when considering cross-boundary development.
- **SIO12:** To ensure each flood risk management activity is examined to determine actions required to embed and provide for effective climate change adaptation as set out in the Dublin City Council climate change adaption policy and in the OPW Climate Change Sectoral Adaptation Plan Flood Risk Management applicable at the time.

Regarding the provision of Sustainable Urban Drainage Systems (SuDS), the Plan also outlines specific policies and objectives. The policies of Dublin City Council are listed as:

- **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, and detention basins;
  - The holding of water in storage areas through the construction of green roofs, rainwater harvesting, detention basins, ponds, and wetlands; and
  - The slow-down of the movement of water.

The Objectives regarding SuDs are given as:

- **SIO13**: To provide additional and improved surface water networks to both reduce pollution and allow for sustainable development.
- **SIO14**: To require that any new paving of driveways or other grassed areas is carried out in a sustainable manner so that there is no increase in storm water run-off to the drainage network.

3 Overview of Flood Mechanisms at the Site

In broad terms, the potential sources of flooding at the site can be categorised as:

- Fluvial (River) Flooding: The main risk of fluvial flooding is from the River Liffey;
- Tidal Flooding/Coastal Flooding – The risk from tidal flooding is from surge events in the Irish Sea which can propagate up the River Liffey;
- Pluvial Flooding - Pluvial flooding occurs when the capacity of the local urban drainage network is exceeded during periods of intense rainfall. At these times, water can collect at low points in the topography and cause flooding; and
- Groundwater Flooding – this can occur during lengthy periods of heavy rainfall, typically during late winter/early spring when the groundwater table is already high. If the groundwater level rises above ground level, it can pond at local low points and cause periods of flooding.

Each of these potential sources of flooding is considered in this FRA.

3.1 Historic Flooding at the Site

3.1.1 Information from Floodmaps.ie

Reports and maps from the OPW's Flood Hazard Mapping website (*www.floodmaps.ie*)[5] have been examined as part of this flood risk assessment.

Figure 3 presents an extract from *floodmaps.ie* for the site and its immediate vicinity. It can be seen that there are two recorded flood events in the vicinity of the site and these are detailed in **Table 4** is presented within **Appendix B**.

Figure 3: Extract from *www.floodmaps.ie*

Table 4: Details on recorded flood event (Source: www.floodmaps.ie)

Location	Date	Source and Cause	Flood Depth	Impact
Aisling Hotel, Parkgate St, Dublin 8 approximately 100m from the proposed development	24-10-11 to 25-10-11	Significant rainfall resulted in overland flows from Conyngham Road. Some flow may have come from the Phoenix Park and possibly the nearby Viceregal Stream. The water then pooled in front of the Aisling Hotel and eventually flooded its ground floor entrance. Water from Montpellier Hill also came into the car park at the rear of the hotel	0.15m at the front of the hotel	The Aisling Hotel was affected by this flood event. Benburb Street was flooded for 100m in front of the hotel. The Luas red line was flooded for 100m in front of the hotel.
Bridgewater Quay Apartments, Islandbridge, Dublin 8	24-10-11	According to local residents, surface water runoff from the Phoenix Park flowed into the Bridgewater Quay apartment complex car park and onto the South Circular Road Bridge footpath. The area is in close proximity to the Magazine Stream, which rises in and transverses the Phoenix Park. The River Liffey did not burst its banks in this area, it flooded a low-lying pedestrian walkway.	0.1m-0.5m	There were 11 ground floor apartments affected by the event. 30m of the South Circular Road Bridge and footpath were affected by this event. Part of the wall on the bridge also collapsed.

As outlined in **Table 4** above, both of the historic flood events were caused by the local drainage network being exceeded which led to overland flow and water collecting in localised low-lying areas.

It is noted that the site of the proposed development was not flooded during either of the flood events. There is therefore no historic record of flooding of the site. The absence of a historic record of flooding however does not mean that the site has not flooded in the past.

3.1.2 Additional Historic Flood information

From previous Flood Risk Assessments of sites in the vicinity of Parkgate Street, Arup has identified other historic flood events in the area, including:

- On 01 February 2002 Dublin City experienced a very high tidal event which flooded Victoria Quay which is approximately 130m from the site of the proposed development. The recorded tidal level for the event was 3.12mOD at the Sarah Bridge approximately 0.5km upstream of the site;
- Victoria Quay (approximately 130m from site) was flooded on 24 October 2011; and
- Victoria Quay and Wolf Tone Quay were both flooded on 03 January 2014. The maximum recorded level during this event was 3.14mOD. Refer to Figure 4 below:

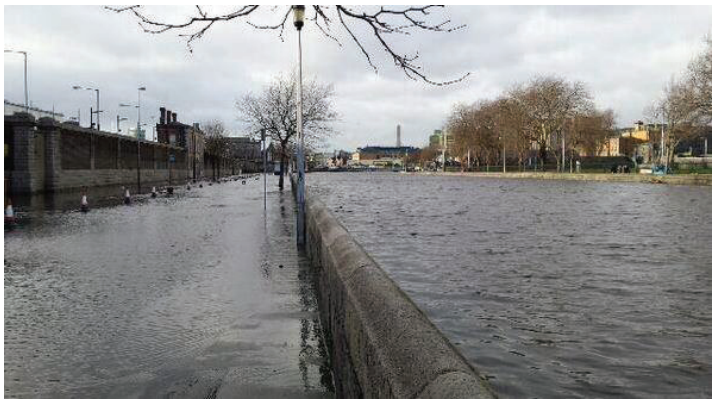


Figure 4: Flooding at Victoria Quay in January 2014

It is noted that the subject site has not been flooded in any of the historic flood events outlined above. While there have been recorded flood events in the vicinity of the proposed development site, there is no record of the site itself having flooded in the past.

3.2 Fluvial Flood Risk

Fluvial flood risk to the site has been assessed by assessing fluvial flood extents maps available produced as part of the *Eastern CFRAM Study*[3].

Figure 5 presents an extract from the *Eastern CFRAM Study* fluvial flood extent map which highlights the flood extents for the 10%, 1% and 0.1% Annual Exceedance Probability (AEP) events. It can be seen from the figure that the site of the proposed development is outside the 1% Fluvial AEP flood extent. A very small area along the southern boundary is indicated as being within the 0.1% AEP extent.

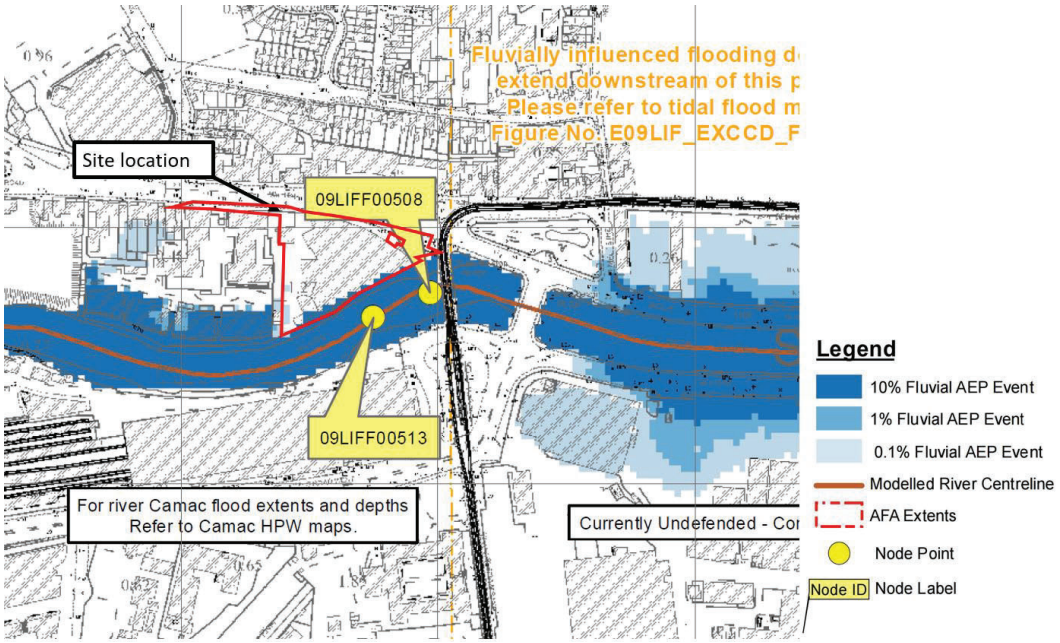


Figure 5: Extract from the Eastern CFRAM Study fluvial flood extents map with application boundary overlaid

Predicted maximum water levels from the hydraulic model used to generate the flood map for the nearest node point to the site are indicated in **Table 5** below. It can be seen from the table that the maximum water level for the 1% AEP fluvial flood event level is 3.11mOD which is circa 200mm below the lowest existing ground level of the site along the southern boundary of the site (approximately 3.30mOD).

Table 5: Maximum fluvial water levels at the model nodes closest to the site (Source: Eastern CFRAM Study)

Node Label	Water Level (OD) 10% AEP	Water Level (OD) 1% AEP	Water Level (OD) 0.1% AEP
09LIFF00513	2.82	3.10	3.50
09LIFF00508	2.82	3.11	3.51

We note that in the Mid-Range Future Scenario (30-year future scenario taking potential climate change implications into account) the site will be at risk from fluvial flooding. This however will be addressed as part of the proposed development as outlined in Section 4 of the report.

3.3 Tidal/Coastal Flooding

The risk of tidal or coastal flooding has been assessed by examining the tidal flood extents maps available as part of the *Eastern CFRAM Study*[3].

Figure 6 presents an extract from the Eastern CFRAM Study tidal flood map which shows the flood extents for the 10%, 0.5% and 0.1% Annual Exceedance Probability (AEP) events. It can be seen from the figure that the site is outside the predicted 0.5% AEP flood extents.

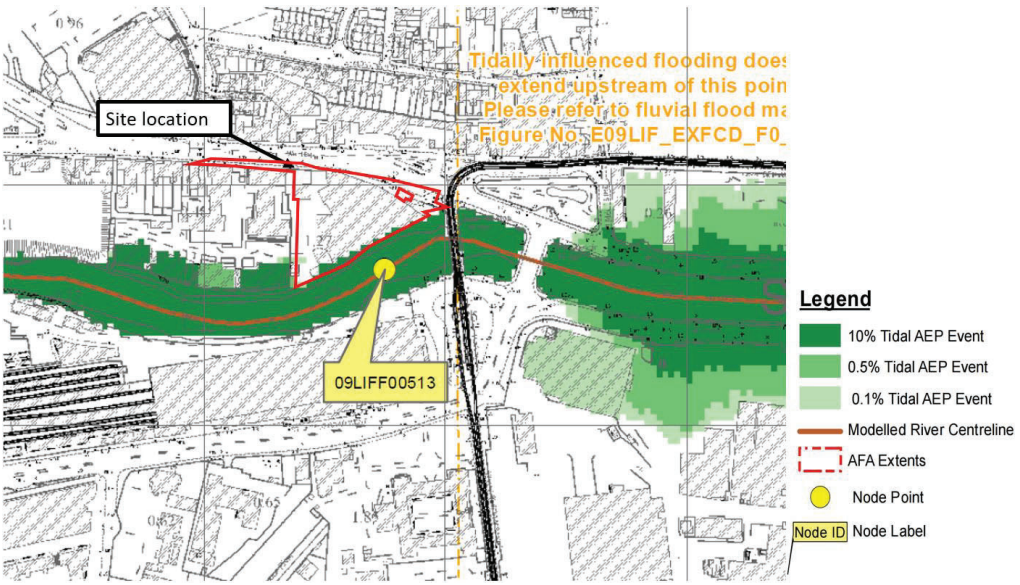


Figure 6: Extract from the Eastern CFRAM Study tidal flood extents map with application boundary overlaid

Predicted water levels from the hydraulic model used to generate the flood map for the nearest node point to the site are indicated in **Table 6** below. It can be seen from the table that the peak 0.5% AEP water level is 3.27mOD which is circa 0.03m below the lowest existing ground level at the site along its southern boundary (circa 3.30m).

Table 6: Maximum tidal water level at the node closest to the site (Source: Eastern CFRAM Study)

Node Label	Water Level (OD) 10% AEP	Water Level (OD) 0.5% AEP	Water Level (OD) 0.1% AEP
09LIFF00513	2.86	3.27	3.48

We note that in the Mid-Range Future Scenario (30-year future scenario taking potential climate change implications into account) the site will be at risk from tidal flooding. This however will be addressed as part of the proposed development as outlined in Section 4 of the report.

3.4 Pluvial Flooding

The risk of pluvial flooding has been assessed by the flood maps produced as part of the Preliminary Flood Risk Assessment (PRFA)[2] by Office of Public Works (OPW) which we note are readily available to view on *www.myplan.ie*.

Figure 7 presents the PRFA pluvial flood extents map for the site location. It can be seen from the figure that the majority of the site is outside of the 1% AEP pluvial flood extent.

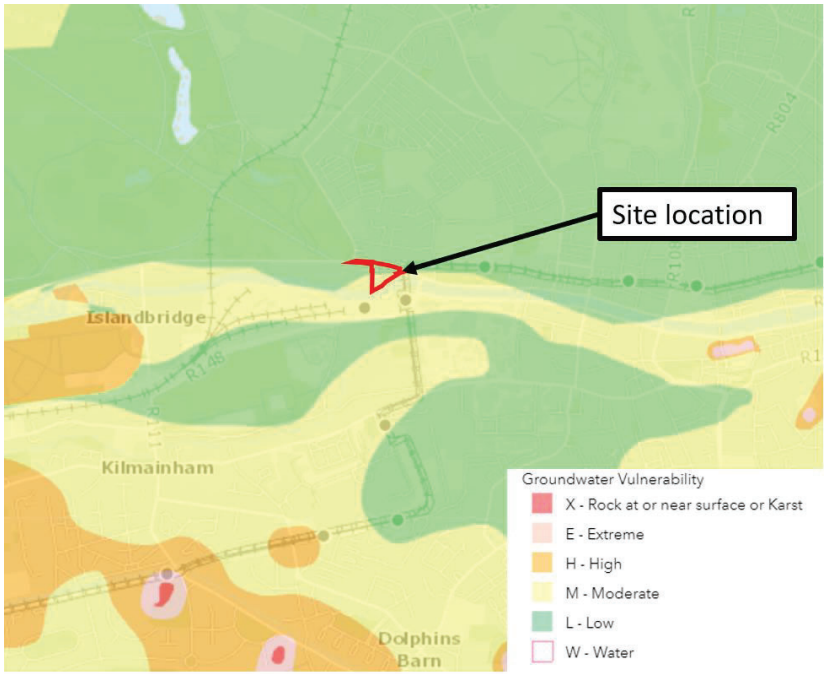


Figure 7: Extract from the PRFA pluvial flood extents map with the application boundary overlaid

3.5 Groundwater Flooding

Water levels in four boreholes were recorded over a four-week period between the 14th August and 12th September 2019 as part of the site investigation works for the proposed development. The groundwater level in both the natural sand and the gravel aquifer and in the limestone bedrock aquifer varied with the tide during the monitoring period. The groundwater levels for the four boreholes electronically monitored are presented in the table below:

Table 7: 2019 Site investigation groundwater levels

Location ID	Aquifer Type	Groundwater Level Maximum (m OD)	Groundwater Level Minimum (m OD)
BH101	Sand and Gravel	1.18	0.18
BH102	Limestone bedrock	0.91	0.12
BH103	Sand and Gravel	1.08	0.82
BH106	Sand and Gravel	1.45	-0.38

It can be seen from the data that water was generally encountered between -0.38mOD and 1.18mOD which is below the existing ground levels (3.30mOD – 5.5mOD) on the site.

Site investigation was also conducted on the site in 2002 and 2003 and this data has been reviewed by Arup as part of this FRA. Groundwater monitoring standpipes were installed in 6 of 8 boreholes drilled on the site at that time. Water was generally encountered in the gravel aquifer at 3.0m - 4.0m below ground level. This would indicate that the groundwater level lies at approximately 0.5m – 1.0mOD Malin and this generally correlates with the 2019 site investigation data outlined above.

Also, as the site is in close proximity to the River Liffey it can be expected that there will be hydraulic connectivity between groundwater levels and tidal levels and this was confirmed during the 2019 site investigation. As existing ground levels are higher than the tidal levels the risk of groundwater flooding is considered to be low.

4 Proposed Mitigation Measures

4.1 Establishment of Design Flood Levels

4.1.1 Predicted 1 in 200 Year Tidal Level at the Subject Site

As established in Section 3.3, the 1 in 200 year (0.5% AEP) maximum tidal water level at the site is 3.27mOD. As this level is higher than the 1% AEP fluvial water level it will be used as the flood level for the site.

4.1.2 Climate Change

The OPW has issued Draft Guidance on the "*Assessment of potential future scenarios for Flood Risk Management*"[8] which suggests the use of two scenarios; a mid-range future scenario (MRFS) and a high-end future scenario (HEFS). The MRFS represents a likely future scenario which is within the bounds of the widely accepted projections. The HEFS is a more extreme, but plausible future event, and is within the upper bounds of the widely accepted projections. These are detailed within the table below.

Table 8: Allowance in Flood Parameters for the Mid-Range and High-End Future Scenarios (Source: Table 3.2 OPW Climate Change Sectorial Adaption Plan)[8]

Parameter	MRFS	HEFS
Extreme Rainfall Depths	+20%	+3-%
Peak Flood Flows	+20%	+30%
Mean Sea Level Rise	+500mm	+1000mm
Land Movement	-0.5mm/year[1]	-0.5mm/year[1]
Urbanization	No general allowance – Review on Case-by-Case Basis	No general allowance – Review on Case-by-Case Basis
Forestation	-1/6 Tp^2	-1/3 Tp^2 + 10% SPR[3]

Note 1: Applicable to the southern part of the country only (Dublin – Galway and south of this)

Note 2: Reduction in the time of peak (Tp) to allow for potential accelerated runoff that may arise as a result of drainage of afforested land

Note 3: Add 10% to the Standard Percentage Runoff (SPR) rate: This allows for temporary increased runoff rates that may arise following felling of forestry.

There are a number of conclusions that can be taken from the predictions made on climate change implications:

- Increases in sea levels may result in extreme tidal events, with tidal levels increasing by more than a meter in the next century; and
- Increase in the frequency of extreme events, particularly hydrological extremes, storms and droughts may cause an increase in rainfall intensity, duration and amount, resulting in increased surface water runoff.

[8] The Office of Public Works and the Department of Environment, Heritage and Local Government. Draft for Consultation Climate Change Sectorial Adaptation Plan Flood Risk Management (2015 – 2019)

Based on this, we propose accounting for climate change by considering a 550mm increase in the water levels in the estuary as per the Mid-Range Future Scenario.

4.1.3 Freeboard

A detailed freeboard analysis has not been undertaken as part of this study. However, it is generally recognised and accepted in Ireland, that a minimum freeboard of 300mm is appropriate with a higher freeboard where this is justified.

A freeboard of 300mm has therefore been adopted as part of the study.

4.1.4 Recommended Site Flood Defence Level

From our analysis of the available data and report, the 200-year design tidal level at our site of interest was estimated to be 3.27mOD.

Allowing for climate change and freeboard the recommended design level of the proposed development can be calculated as:

3.27mOD (200-year tidal level) + 0.55m (climate change allowance) + 0.30m (freeboard allowance) = **4.12mOD Malin**

5 Management of Residual Flood Risk at the Site

5.1 Proposed Ground Floor Level

It is proposed to set the ground floor levels of the proposed buildings of the development between 5.2mOD and 6.0mOD. This is between 1.08m and 1.88m above the minimum recommended site flood defence level as outlined in **Section 4.1.4.**

Flood risk to the buildings of the proposed development is therefore remote. The development therefore complies with the OPW Planning Guidelines.

5.2 Basement of the Development

The basement area of the proposed development will be split into two sections with a floor level of approximately 2.0mOD and 3.0mOD respectively. To mitigate against the risk of groundwater ingress the basement will be fully sealed and tanked to ensure water cannot penetrate it.

It is noted that policy objective SI13 of the Dublin City Council Development Plan 2016-2024[4] states that *"development of basements or any above-ground buildings for residential use below the estimated levels for Zone A or Zone B will not be permitted."* The basement for the proposed development will be compliant with this objective as it includes plant areas, office staff changing facilities, bicycle storage and car parking and will not be for residential use.

The vehicular entrance to the basement of the proposed development will be from Parkgate Street and will be set at level of approximately 5.7mOD. This is circa 1.58m above the site flood defence level and is therefore not at risk of tidal or fluvial ingress.

A 150mm high ramp will be provided at the basement entrance to prevent surface water ingress from Parkgate Street.

5.3 Access and Egress Routes to the Site

The internal river walk to be provided at the south west corner of the site which will be graded to facilitate the future tie into the existing boardwalk along the River Liffey at a level of approximately 2.9mOD. The proposed internal river walk slopes and steps down from an access and egress point at the ground level public plaza which is at a level of approximately 4.9mOD. This is shown in Figure 8 below:

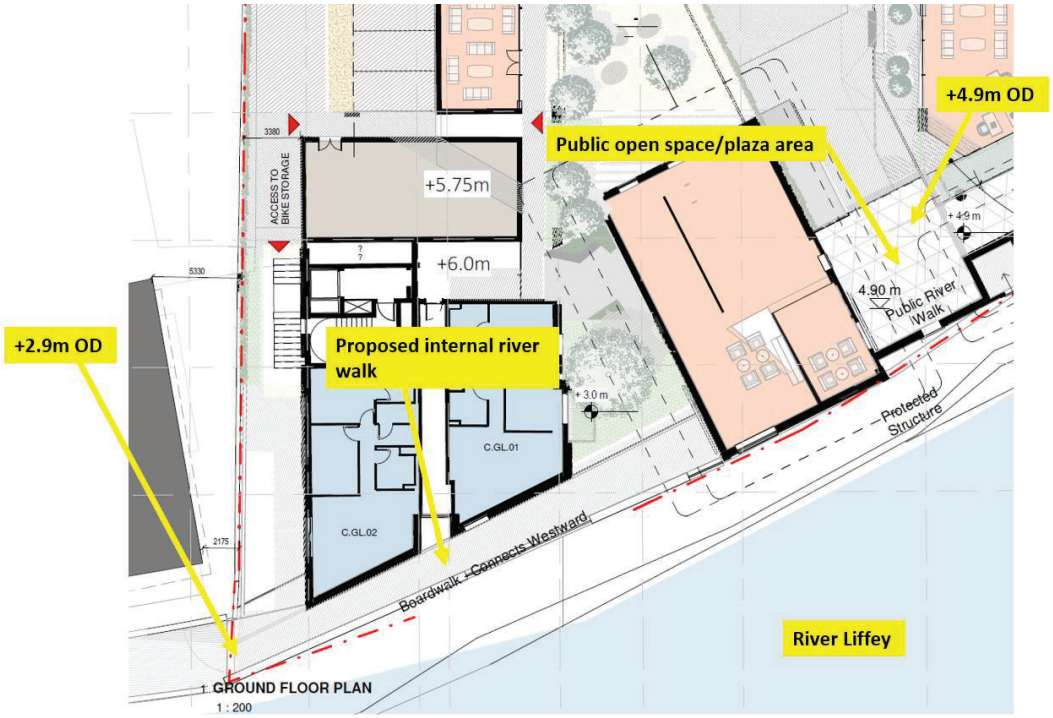


Figure 8: Proposed internal river walk at the south west corner of the site

It can be seen from the figure that a section of the internal river walk is below the 1 in 200-year tidal flood level of 3.27m and the recommended site flood defence level of 4.12mOD. The access and egress point is however at a level of 4.9mOD and is not a main access and egress point to the building. It is proposed that a security door be installed at this point which can be closed during a flood event.

No other access and egress routes to the site will be compromised during flood events.

5.4 Storage and conveyance

The proposed development will have no impact on floodplain storage and conveyance as it is located outside the 1 in 1000 year fluvial and coastal flood plain.

5.5 Pluvial Flood Risk

In the event of an extreme rainfall event and/or blockage of the drainage system of the site, the capacity of the drainage system could be exceeded leading to surface water ponding at the site.

The risk of surface water ingress to the proposed building is very low as ground levels around the site perimeter generally fall away from the buildings. There is a low point on Parkgate Street where there is potential for surface water to pond. In order to mitigate against this a drainage channel to collect surface water will be provided at this point which is between the entrance to the two buildings.

In addition to this all doorways and entrance points to the building will either be raised slightly above external ground levels or have a drainage channel installed across the entrance point to collect surface water. A minor fall will also be provided on all paved surfaces to direct surface water to the drainage system.

Figure 9 illustrates the direction of surface water drainage for the Parkgate Street perimeter of the site.

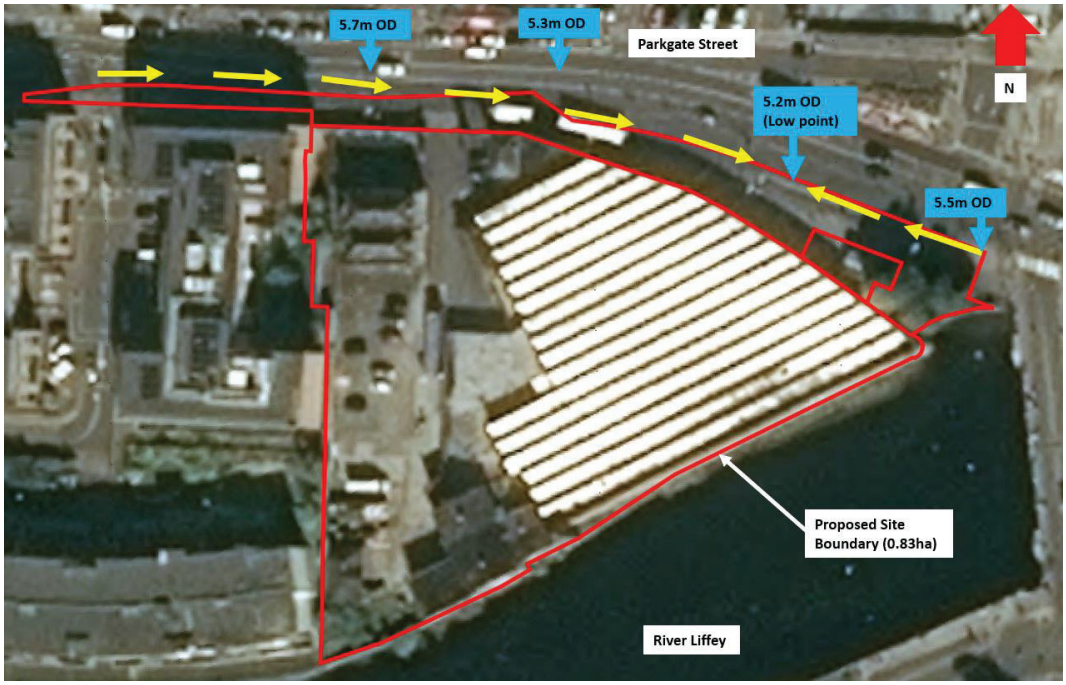


Figure 9: Surface water drainage directions (Source: adapted from Google Maps)

5.6 Flood Emergency Plan

A tidal flood forecasting and warning system for Dublin Bay is operated by Dublin City Council and provides warnings of extreme tidal flooding. Extreme flood events will therefore be well forecast. As part of the emergency response plan, staff in the buildings of the proposed development will be kept well informed of flood and weather forecasts on an on-going basis as well as receiving warnings from Dublin City Council. In the event of a significant flood event being forecast, the emergency response plan will be implemented. This will involve ensuring that no occupants of the proposed development remain at a level below 4.12mOD (for instance at the internal river walk area next to the River Liffey).

6 Application of "The Planning System and Flood Risk Management" Guidelines

6.1 Vulnerability Classification

It is considered that the development should be classed as a "*highly vulnerable development*" as per the vulnerability classification presented in **Table 9** below:

Table 9: Classification of vulnerability of different types of development (Source: OPW *"The Planning System and Flood Risk Management"* Guidelines)

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).
*Uses not listed here should be considered on their own merits	

6.2 Flood Zones

Based on the analysis presented in this FRA report, the subject site is not at risk of flooding from either the 0.5% AEP tidal event or the 1% AEP event. A very small area of the site is marginally within the 0.1% AEP tidal and fluvial extents. While this level of flood risk could be interpreted as a Flood Zone C classification we have adopted a conservative approach and considered the entire site as being within Flood Zone B.

6.3 Sequential Approach

Figure 10 below illustrates the sequential approach to be adopted under the "Planning System and Flood Risk Management Guidelines".

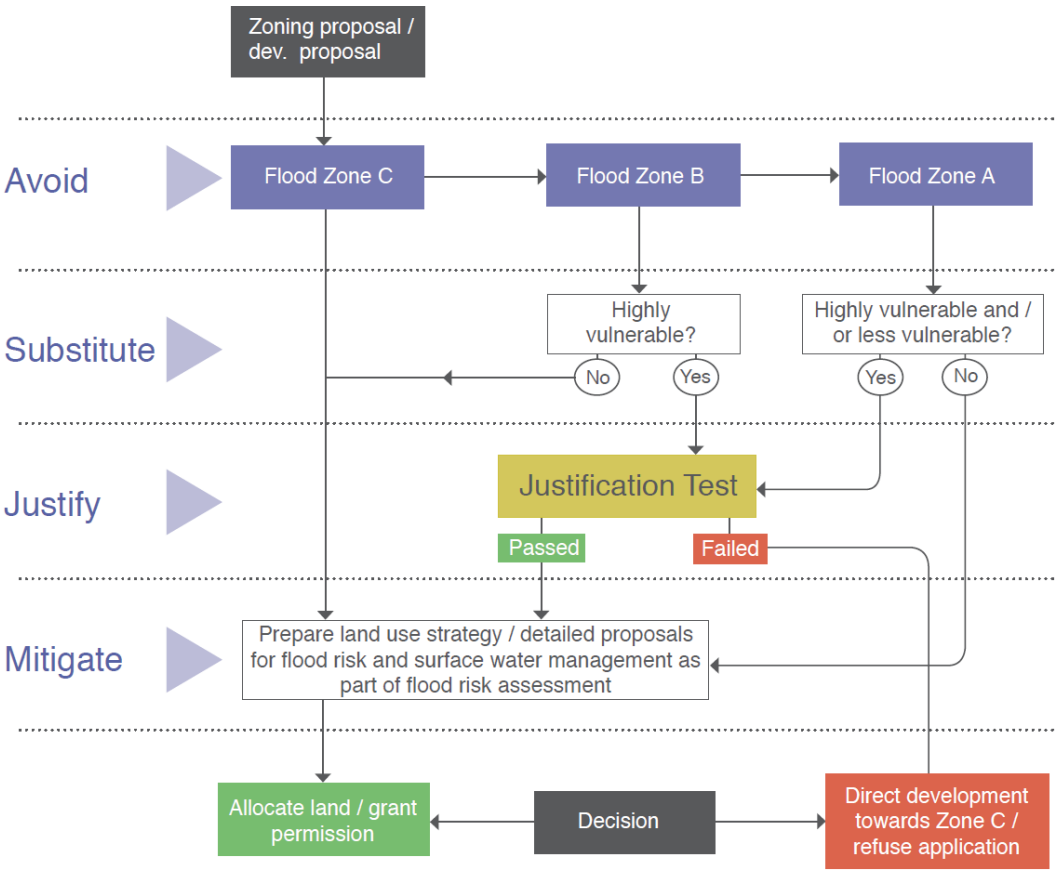


Figure 10: Sequential approach mechanism in the planning process (Source: OPW *"The Planning System and Flood Risk Management"* Guidelines

As per Figure 10 above the proposed development is a "highly vulnerable development" (for residential use) that lies within Flood Zone B. A Justification Test for development is therefore required and is presented in Section 6.4 and Section 6.5 of this report.

6.4 The "Plan Making Justification Test" from Chapter 4 of the OPW Flood Risk Management Guidelines

The Justification Test for Plan Making requires that three criteria must be met as shown in the following figure:

Box 4.1: Justification Test for development plans

Where, as part of the preparation and adoption or variation and amendment of a development/local area plan[1], a planning authority is considering the future development of areas in an urban settlement that are at moderate or high risk of flooding, for uses or development vulnerable to flooding that would generally be inappropriate as set out in Table 3.2, all of the following criteria must be satisfied:

1 The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act, 2000, as amended.

2 The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular:

(i) Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement[2];

(ii) Comprises significant previously developed and/or under-utilised lands;

(iii) Is within or adjoining the core[3] of an established or designated urban settlement;

(iv) Will be essential in achieving compact and sustainable urban growth; and

(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.

3 A flood risk assessment to an appropriate level of detail has been carried out as part of the Strategic Environmental Assessment as part of the development plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the lands will not cause unacceptable adverse impacts elsewhere.

N.B. The acceptability or otherwise of levels of any residual risk should be made with consideration for the proposed development and the local context and should be described in the relevant flood risk assessment.

Figure 11: Justification Test for Development (Source: OPW "The Planning System and Flood Risk Management" Guidelines)

The "Plan Making Justification Test" relevant to the proposed development was completed and passed as part the Strategic Flood Risk Assessment (SFRA) undertaken for the *Dublin City Council Development Plan 2016 - 2022.*

The SFRA is included under Volume 7 of the DCC Development Plan and is available to download from the Dublin City Council website: (http://www.dublincity.ie/sites/default/files/content/Planning/DublinCityDevelopmentPlan/Documents/DCCo_DevelopmentPlan_Vol7.pdf.pdf).

The proposed development lies within Site 5 of the Justification Test Tables in the SFRA (refer to pages 115-118). The Justification Test Tables for Site 5 are shown in Figure 12 and included in full in **Appendix D** of this report.

Site: 5. Liffey: Sean Heuston Br. – Sarah Bridge, South Circular Road

Justification Test for Development Plans

1. Section 1 is covered elsewhere in this SFRA Justifying all of Dublin City

2. The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular:

(i) Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement
Answer: Yes: This area forms part of the central area of the City. The lands form part of an established built up part of the City close to Strategic Rail Infrastructure. The area around Heuston is identified as Strategic Development and Regeneration Area (SDRA 7 Heuston & Environs; See section 15.1.1.10 of the Written Statement) under the Core Strategy, which are important brownfield sites with the potential to deliver a significant quantum of mixed-uses and create synergies to regenerate their respective areas. An urban design land use framework plan for the regeneration of the Heuston area was produced in 2003. Since the publication of the 2003 report this area has undergone significant redevelopment, including much of the Heuston South Quarter and development at Clancy Barracks. A number of significant land banks still remain to be developed and for these the guiding principles have been set out in section Chapter 15 of the Written Statement.(see section 15.1.1.10 of the written statement)

(ii) Comprises significant previously developed and/or under-utilised lands
Answer: Most of the lands within Flood Zone A and B are already built up or comprise of brownfield sites.

(iii) Is within or adjoining the core of an established or designated urban settlement
Answer: Yes: This area forms part of the Central Core of the City.

(iv) Will be essential in achieving compact and sustainable urban growth
Answer: Yes: This area is essential to achieving compact and sustainable urban growth.

(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
Answer: There are no suitable alternative lands for the particular uses or development type in areas at lower risk of flooding, within or adjoining the urban settlement. Areas idenitifed as being in Flood Zones A and B are considered essential to achieving a consolidated urban centre and to comply with the NSS and RPG.

Site: 5. Liffey: Sean Heuston Br. – Sarah Bridge, South Circular Road

3. Strategic Flood Risk Assessment for Flood Zones A and B (for defended Flood Zones A and B see section 4.8)

- To a large extent the areas indicated as being within Flood Risk Areas are generally built out or are existing brownfield sites and the opportunities for future development are limited. The extents of Flood Zone A and B are not significant along much of this reach of the Liffey, with most flood risk arising from the River Camac.
- There are a number of identified flood cells along this stretch of the River Liffey, and cover areas currently zoned Z5 which is to consolidate and facilitate the development of the central areas and to identify, reinforce and strengthen and protect its civic design character and dignity. There are some areas zoned Z1 which is to protect, provide and improve residential amenities.
- Given the combined tidal and fluvial influences in this section of the River Liffey, a joint probability assessment should be carried out to determine finished floor levels. The assessment should take into account the combined impacts of a peak tide and a peak flow occurring at the same time. Given that an event such as this would have a greater rarity that either event occurring individually a pragmatic approach should be taken to applying the findings. For example, whilst it would be appropriate to consider joint probability levels in the redevelopment of brown field sites, for individual or infill developments such allowances may prohibit connection with the existing streetscape.
- The River Camac is currently subject to assessment under the Eastern CFRAM Study, which is reviewing the need for, and potential options to manage flood risk. Development at the downstream end of the Camac (around Heuston Station and St. James's Gate) should take into account the findings of the CFRAM Study. In this regard, until the Flood Risk Management Plan has been published, and any recommendations implemented, large scale development in this area should be proceeded with caution.
- FRA's should be carried out for all basements and underground structures with respect to any human access.

Figure 12: Justification Test for Development Plans (Source: Dublin City Council Development Plan 2016-2022 Strategic Flood Risk Assessment)

6.5 The "Development Management Justification Test" from Chapter 5 of the OPW Flood Risk Management Guidelines

The "Development Management Justification Test" requires that two criteria must be met as follows:

1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.
2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:
   - (i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;
   - (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;
   - (iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and
   - (iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

Figure 13: The Justification Test for development management (Source: OPW "The Planning System and Flood Risk Management" Guidelines)

6.5.1 Item 1

With regard to Item 1 in Figure 13, the applicable policy context is the *Dublin City Council Development Plan 2016 - 2022*. Under the scheme the subject site is specifically identified as being included within Specific Development Regeneration Area (SDRA) No. 7 Heuston and Environs. Figure 14 presents an extract from the map for SDRA No.7. It can be seen that that the area is identified for redevelopment as a new mixed-use and residential area.

As the DCC Development Plan as adopted took full account of the OPW Guidelines and incorporated an SFRA as part of an appraisal of the plan, and the site has been designated for the form of development proposed, we can therefore state this this criterion is passed.

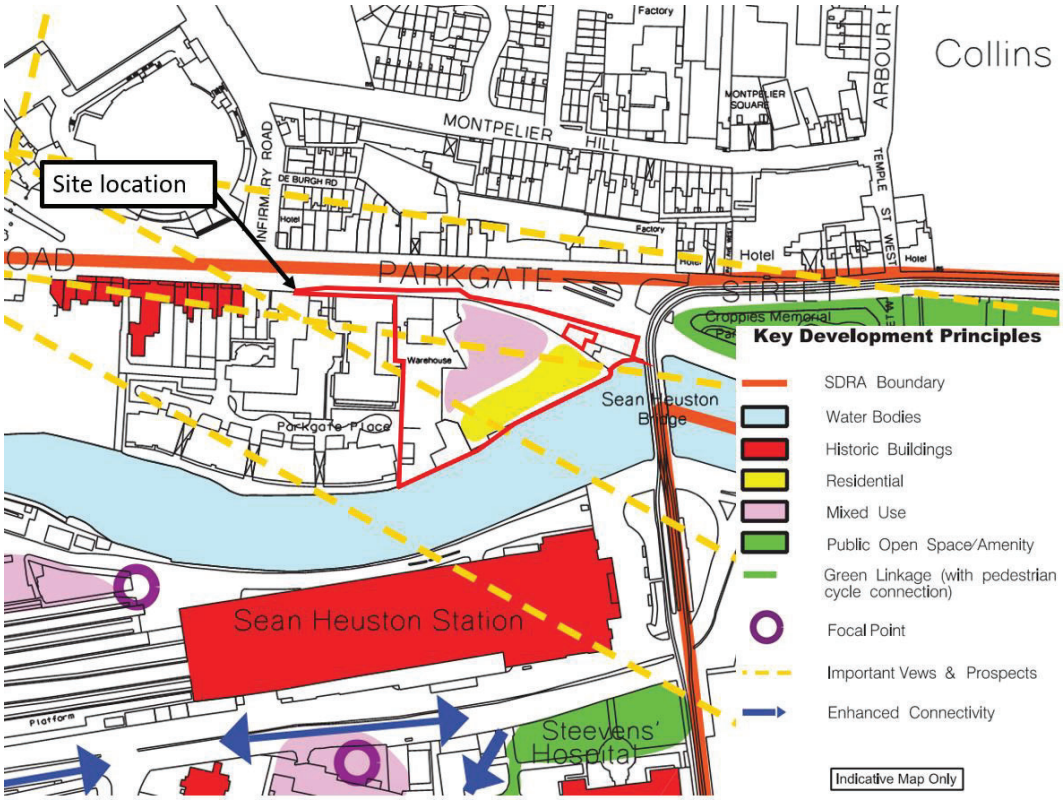


Figure 14: Key development principles for SDRA Area No.7 (Source: DCC Development Plan 2016-2022 Figure 27)

6.5.2 Item 2

With regard to Item 2, we consider that these criteria have been met as follows:

- *The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;*

The proposed development will not increase the risk of flooding at adjacent sites. There will be no increase in the overall hardstanding area and the new drainage network to be provided as part of the development will be more effective than the current drainage on the site.

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

The development proposal includes a number of measures to minimise flood risk which include the following:

1. The ground floor levels of the proposed buildings on the site will vary between 5.2mOD and 6.0mOD. This is between 1.08m and 1.88m above the minimum recommended site flood defence level as outlined in **Section 4.1.4.**
2. The basement will be fully sealed and tanked to ensure that water cannot penetrate it.

3. The proposed development will have no impact on floodplain storage and conveyance as it is located outside of the 1 in 1000 year fluvial and coastal flood plain.
4. The proposed drainage network to be constructed as part of the development includes a number of Sustainable (urban) Drainage features (SuDS)

- *The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measure and provisions for emergency service access*

As previously noted in this report, the residual risk will be managed by ensuring that the ground floor level is set above the site design flood defence level.

- *The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to the development of good urban design and vibrant and active streetscapes.*

The scheme has been designed to the highest standards and creates a successful and vibrant public realm. Measures to address the flood risk have been incorporated into the design without compromising the streetscape and functioning of the development.

It is deemed that these criteria are sufficient for the development to pass this section of the Justification Test.

7 Conclusion

This FRA reviews the risk of flooding for a proposed mixed-use development at Parkgate Street in Dublin 8. This FRA is to form part of the planning application for the development.

There is no historic record of the site having flooded in the past.

While the site borders the River Liffey, flood risk to the site is low and existing ground levels are above the maximum 1% AEP fluvial water level and the 0.5% AEP tidal level. The risk of groundwater and pluvial flooding is also low.

The minimum site flood defence level of the proposed development including an allowance for climate change and freeboard is 4.12mOD.

Flood risk to the buildings on site will be managed by raising ground levels to between 5.4mOD and 6.0mOD.

Access and egress routes will not be compromised during a flood event with the exception of the route to the internal river walk next to the River Liffey. This is not a primary access and egress route for the proposed development and the entrance/exit point to the building itself will be approximately 1.38m above the minimum site flood defence level.

The proposed development will also not impact on floodplain storage or conveyance.

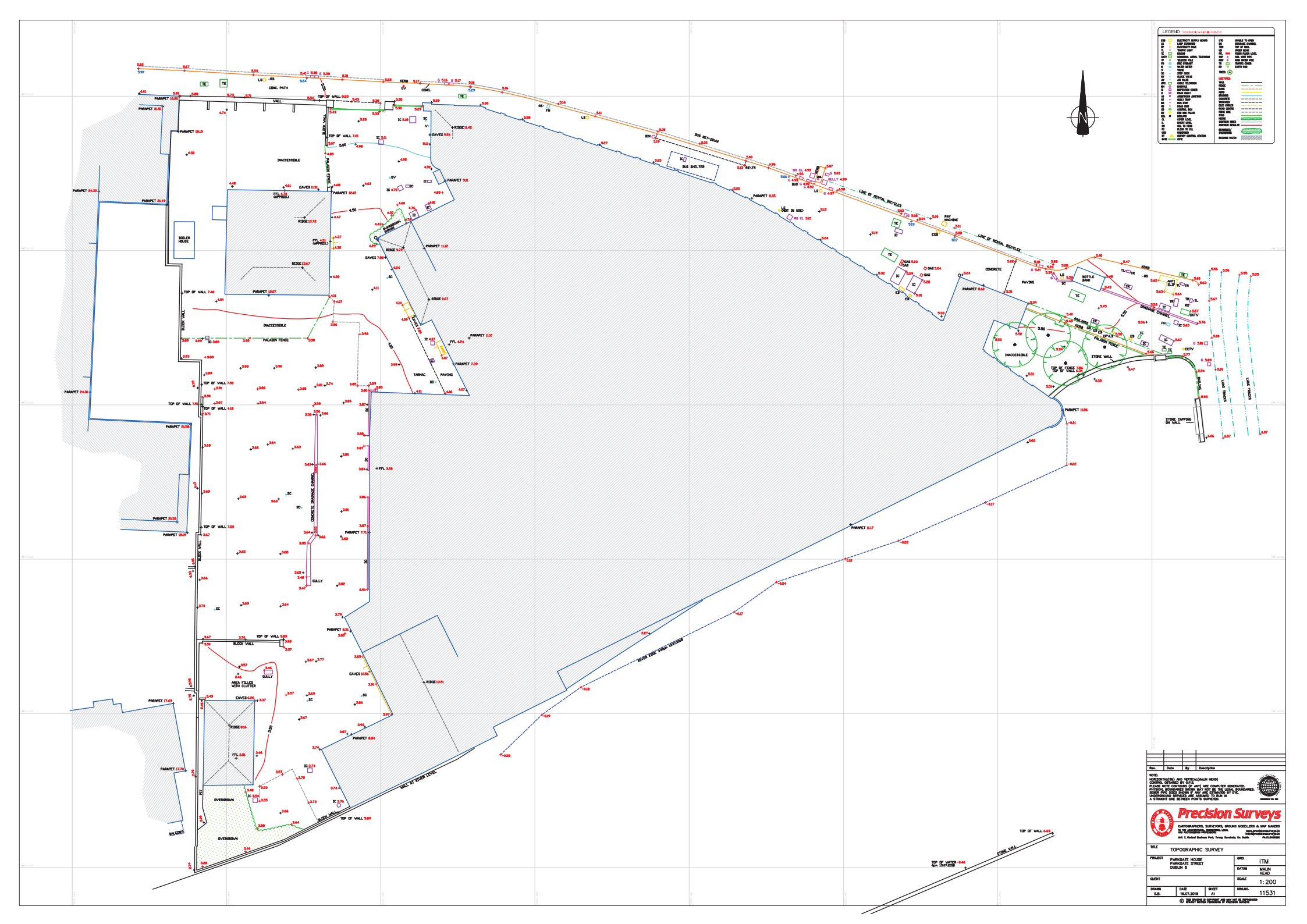
As a small area of the existing site is within the 0.1% AEP tidal flood extent. The site is therefore classified as Flood Zone B and a Justification Test is required. Both the Plan Making and Development Management Justification elements of the Justification test have been assessed and both are deemed to be passed as part of this FRA.

8 References

- Ground Investigations Ireland, July 2019. Hickeys 43 Parkgate Place. Ground Investigation Report
- IGSL, March 2003. Ground Investigation Report No. 8483 Hickey & Co., Parkgate Street on Behalf of Arup Consulting Engineers
- Dublin City Council, 2016. Dublin City Development Plan 2016-2022. http://www.dublincity.ie/main-menu-services-planning-city-development-plan/dublin-city-development-plan-2016-2022 [Accessed: March 2019].
- Geological Survey of Ireland (GSI), 2018. Groundwater Vulnerability Mapping. Available at: www.gsi.ie
- Office of Public Works (OPW), 2009. The Planning System and Flood Risk Management Guidelines for Planning Authorities
- Office of Public Works, OPW, National Flood Hazard Mapping Web Site. http://www.floodmaps.ie/ [Accessed: March 2019].
- The Office of Public Works and the Department of Environment, Heritage and Local Government. Draft for Consultation Climate Change Sectorial Adaptation Plan Flood Risk Management (2015 – 2019) [Accessed: April 2019]
- Office of Public Works (OPW), 2018. Preliminary Flood Risk Assessment Mapping. Available at: www.cfram.ie/pfra [Accessed: March 2019]
- Office of Public Works (OPW), 2018. Eastern Catchment and Flood Risk Assessment Management Mapping. www.floodinfo.ie [Accessed: March 2019]
- Planning and Development Act 2000 (S.I. No. 30 of 2000)

Appendix A

Topographical Survey of Existing Site


LEGEND
NOTE:
HORIZONTAL(E/W) AND VERTICAL(MALIN HEAD)
CO-ORDINATES DERIVED BY G.P.S.
PLEASE NOTE CONTOURS (IF ANY) ARE COMPUTER GENERATED.
PHYSICAL BOUNDARIES SHOWN MAY NOT BE THE LEGAL BOUNDARIES.
SEWER PIPE SIZES SHOWN IF ANY ARE ESTIMATED BY EYE.
UNDERGROUND SERVICES ARE ASSUMED TO RUN IN A STRAIGHT LINE BETWEEN POINTS SURVEYED.
Precision Surveys
CARTOGRAPHERS, SURVEYORS, GROUND MODELLERS & MAP MAKERS
TOPOGRAPHIC SURVEY
PROJECT
PARKGATE HOUSE
PARKGATE STREET
DUBLIN 8
GRID
ITM
DATUM
MALIN HEAD
SCALE
1: 200
CLIENT
DRAWN
S.B.
DATE
16.07.2019
SHEET
A1
DRG.NO.
11531
Rev.
Date
By
Description

Appendix B

Historical Flood Event Information from *floodmaps.ie*

Flooding at Ashling Hotel, Parkgate Street, Dublin 8
24th October 2011

The information contained in this report has been extracted from a Flood Data Collection Form submitted to The Office Of Public Works (OPW) by Consultants working on the Eastern River Basin District (RBD) Catchment Flood Risk Assessment and Management (CFRAM) Project.

1 Location and date of flood event:

Location: Ashling Hotel, Parkgate Street, Arbour Hill, Dublin 8.
Irish Grid Co-ordinates: 313,857 234,438

This flooding event started at 3.30pm on 24th October 2011 and ended at 2am on 25th October 2011, the peak flood occurred at 8pm on 24th October 2011.

2 Source and cause:

Significant rainwater resulted in overland flows down Conyngham Road. Some flows may have come from the Phoenix Park and possibly the nearby Viceregal Stream. The water then pooled in front of the Ashling Hotel and eventually flooded its ground floor entrance. Water from Montpellier Hill also came into the car park at the rear of Hotel.

3 Flood data:

The following flood information was provided:

Flood Parameter	Max Value	Typical Value	Comments
Flood Level (metres OD Malin)			
Flood Depth (metres)		0.15	At front of hotel.
Flood Flow (m^3/s)			
Flood Velocity (m/s)			

Flooding has occurred numerous times at this location.

4 Impacts of flooding event:

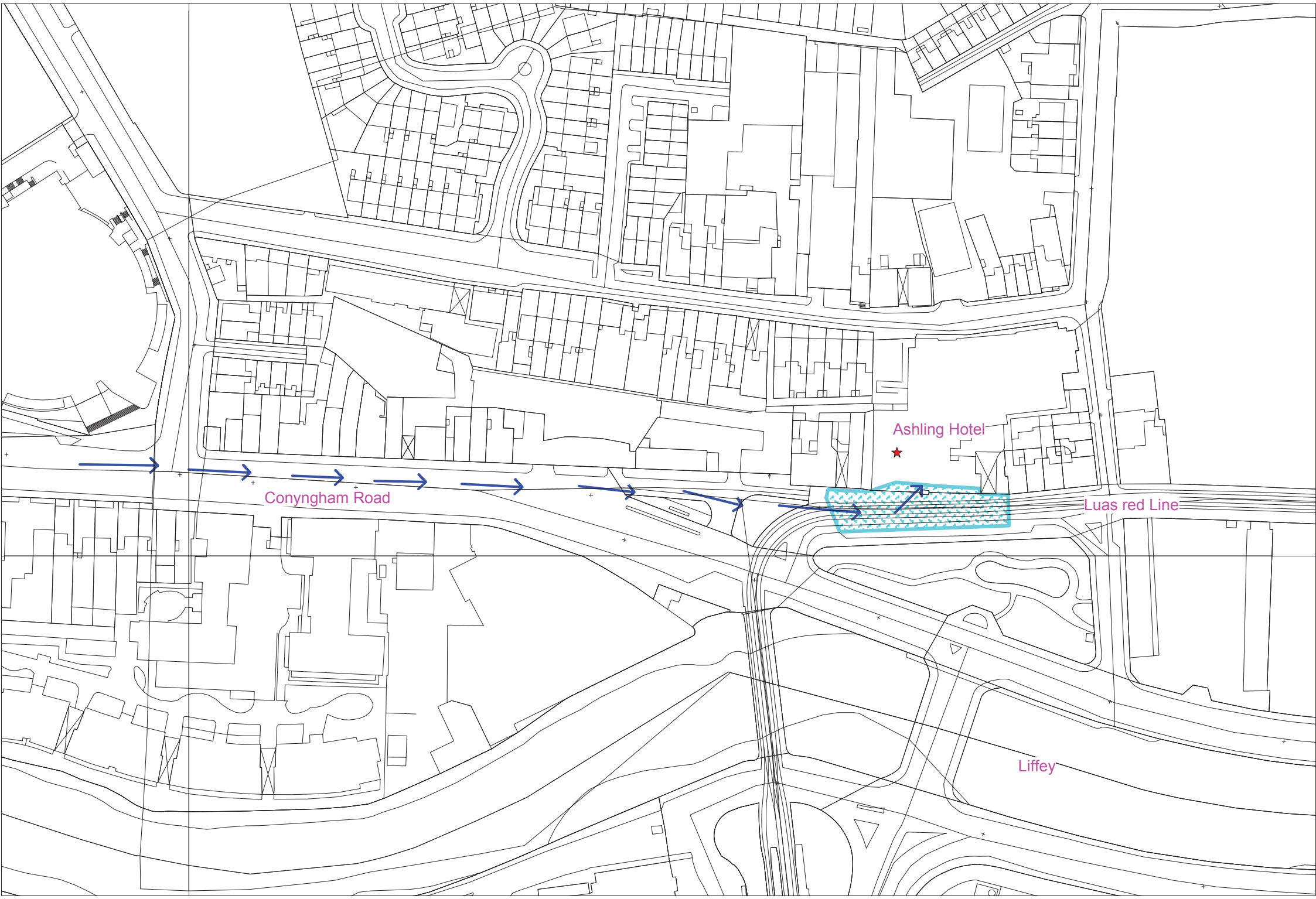
Impacts to Property: **Commercial**- The Ashling Hotel was affected by this flood event.
Impacts to transport infrastructure: Roads – Benburb Street (Urban) was flooded for 100m in front of the Ashling Hotel.
Luas Line: The Luas Red Line was flooded for 100m in front of the Ashling Hotel.

5 Additional information:

There is a historical flooding problem with this hotel. The owner has installed a flood prevention system inside the hotel doors.

6. Documents attached:

A map of the affected area is attached.


Ashling Hotel
Conyngham Road
Luas red Line
Liffey

Flooding at Bridgewater Quay Apartments, Islandbridge, Dublin 8.
24th October 2011

The information contained in this report has been extracted from a Flood Data Collection Form submitted to The Office Of Public Works (OPW) by Consultants working on the Eastern River Basin District (RBD) Catchment Flood Risk Assessment and Management (CFRAM) Project.

1 Location and date of flood event:

Location: Bridgewater Quay Apartments, Islandbridge, Dublin 8.
Irish Grid Co-ordinates: 313,006 234,402

This flooding event started at 6pm and ended at 11pm on 24th October 2011, the peak flood occurred at 7.30pm on 24th October 2011.

2 Source and cause:

According to local residents, surface water runoff from the Phoenix Park flowed into Bridgewater Quay apartment complex car park and onto South Circular Road Bridge footpath. The area is in close proximity to the Magazine Stream, which rises in and transverses the Phoenix Park. The River Liffey did not burst its banks in this area; it flooded a low-lying pedestrian walkway.

3 Flood data:

The following flood information was provided:

Flood Parameter	Max Value	Typical Value	Comments
Flood Level (metres OD Malin)			
Flood Depth (metres)	0.05	0.01	100mm level in car park, 500mm on SCR footpath.
Flood Flow (m^3/s)			
Flood Velocity (m/s)			

It is not known if flooding has previously occurred at this location.

4 Impacts of flooding event:

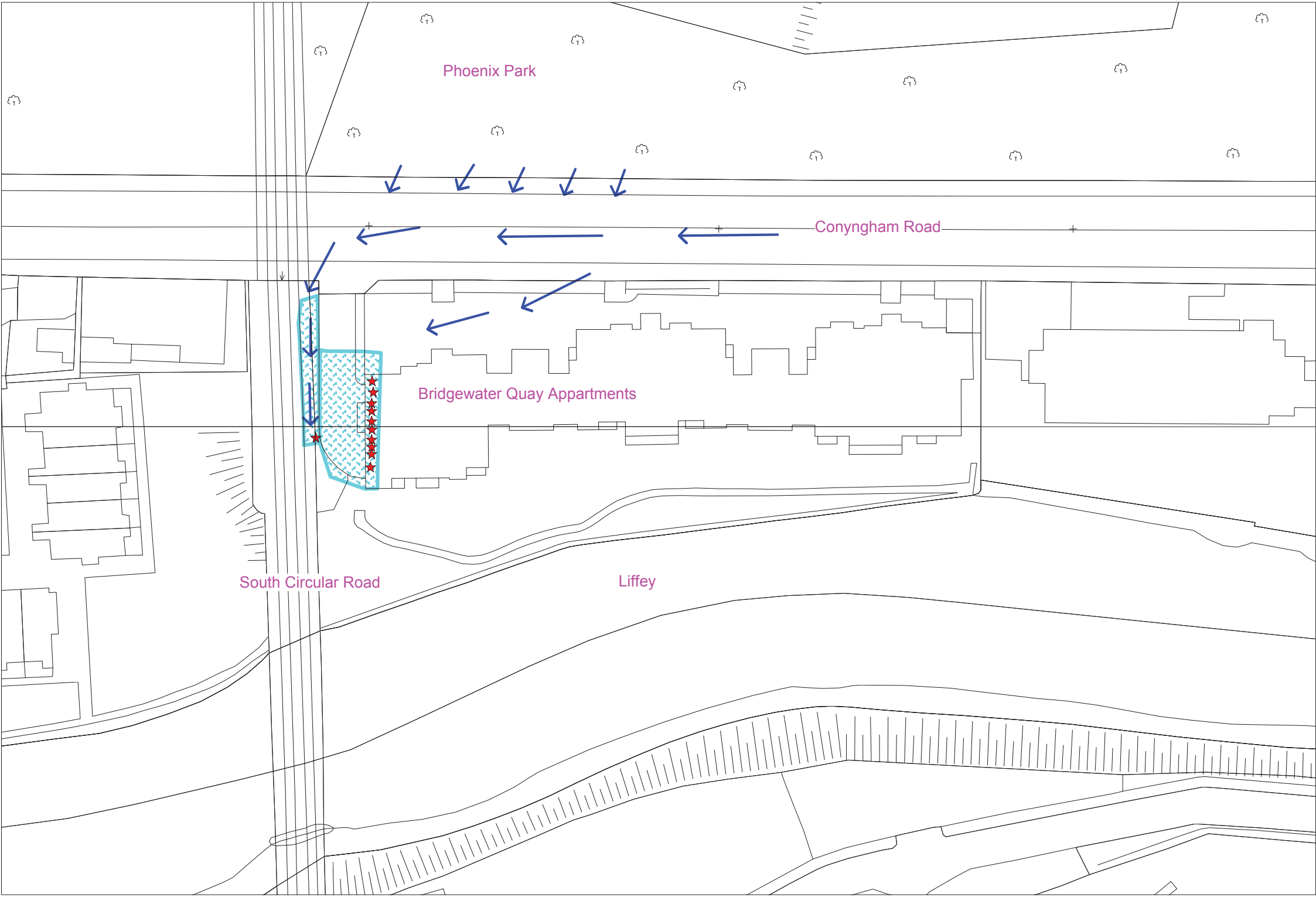
Impacts to people: There was no loss of life as a result of this flooding event.
Impacts to Property: Residential - There were 11ground floor apartments affected by this event.
Impacts to transport infrastructure: Roads – 30m of South Circular Road Bridge (urban) and footpath were affected by this event. Part of the wall on the bridge also collapsed.

5 Additional information:

A part of the high wall from the South Circular Bridge collapsed into the Bridgewater Quay Apartment complex. There was no damage caused to any of the buildings.

6. Documents Attached:

Photographs and a map of the area are attached.


Phoenix Park
Conyngham Road
Bridgewater Quay Appartments
South Circular Road
Liffey

Bridge Water Quay, Dublin 8

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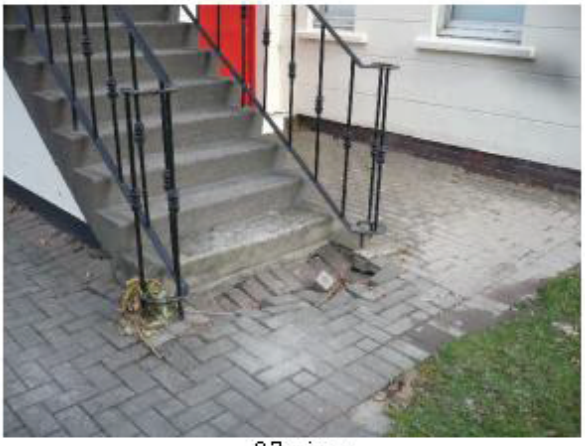

07.jpg

08.jpg

Bridge Water Quay, Dublin 8

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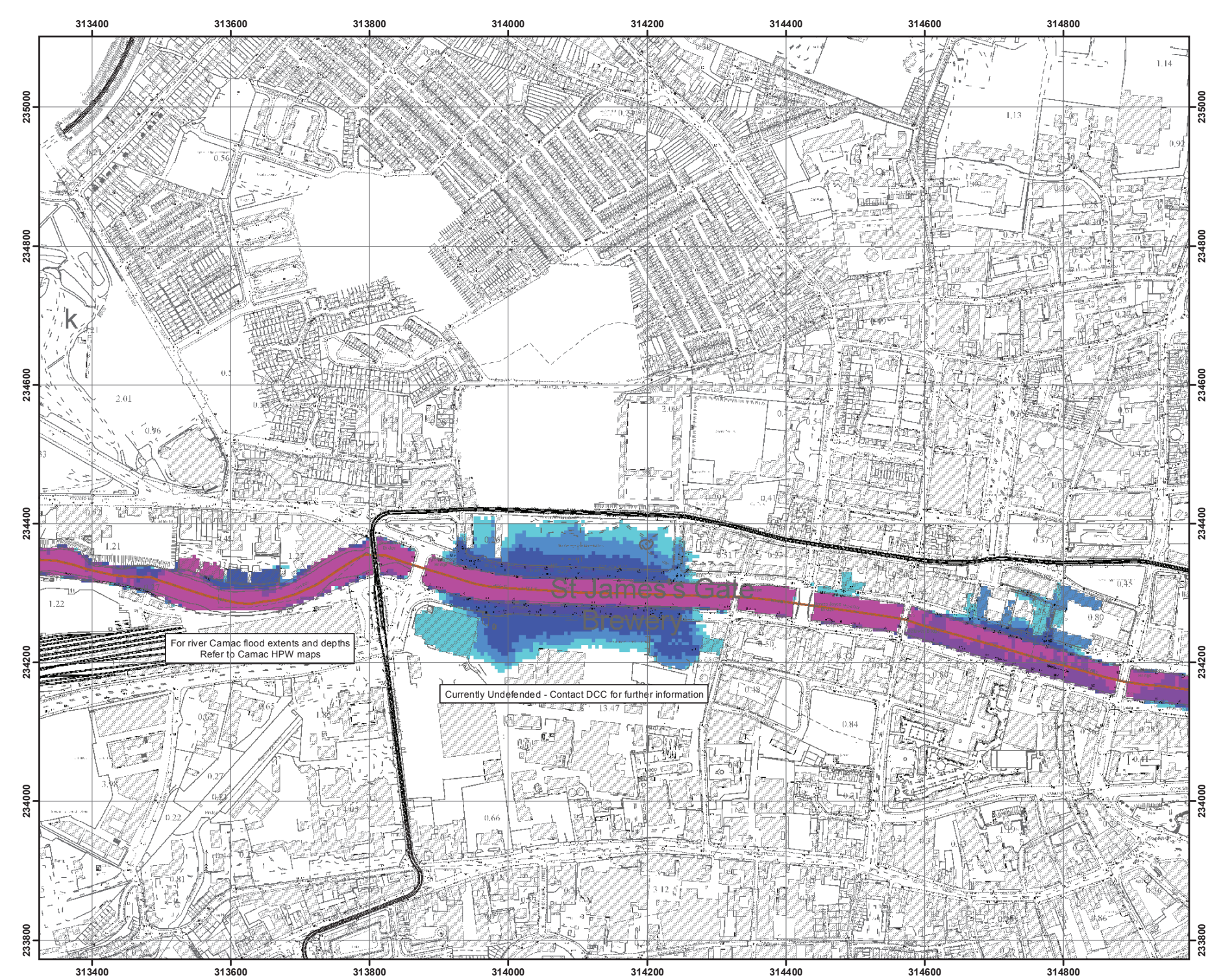
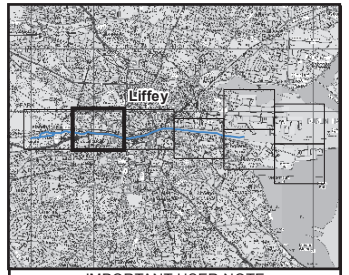
Appendix C

Eastern CFRAM Study
Predictive Flood Maps





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

Legend

0.1% Tidal AEP Flood Depth

- 0 - 0.25m
- 0.25 - 0.5m
- 0.5 - 1m
- 1.0 - 1.5m
- 1.5 - 2m
- >2m

Modelled River Centreline

AFA Extents

FINAL

REV:	NOTE:	DATE:
01	Amendments to Flood Extents.	05/12/16

EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

RPS

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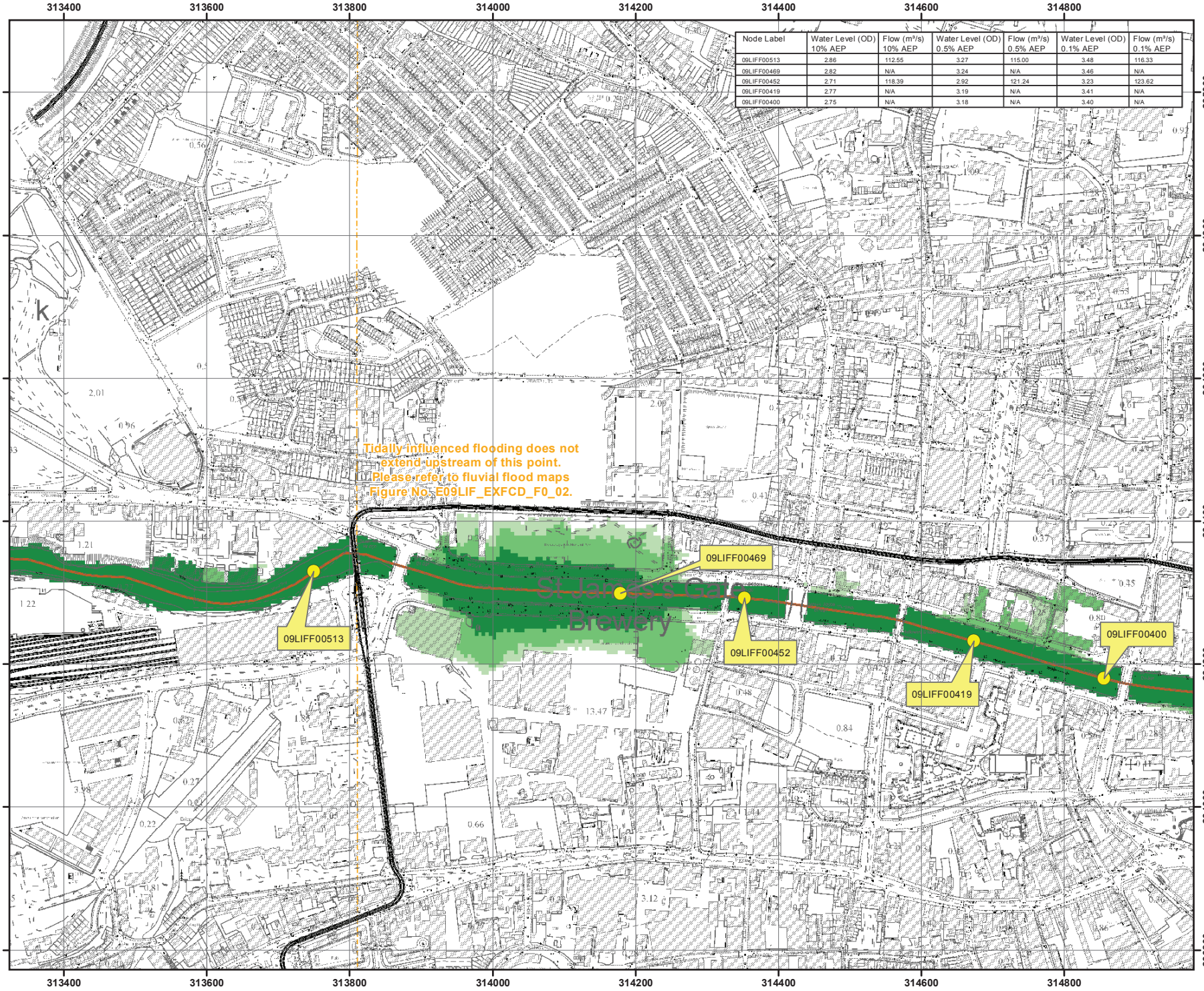
W www.rpsgroup.com
E ireland@rpsgroup.com

Map:
Liffey Tidal Flood Depths

Map Type:	DEPTH
Source:	TIDAL
Map Area:	COASTAL
Scenario:	CURRENT
Drawn By : C.McG.	Date : 9 May 2017
Checked By : A.S.	Date : 9 May 2017
Approved By : G.G	Date : 9 May 2017
Drawing No. :	E09LIF_DPCCD001_F1_02
Map Series :	Page 2 of 8
Drawing Scale : 1:5,000	@A3



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 0.5% AEP	Flow (m³/s) 0.5% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
09LIFF00513	2.86	112.55	3.27	115.00	3.48	116.33
09LIFF00469	2.82	N/A	3.24	N/A	3.46	N/A
09LIFF00452	2.71	118.39	2.92	121.24	3.23	123.62
09LIFF00419	2.77	N/A	3.19	N/A	3.41	N/A
09LIFF00400	2.75	N/A	3.18	N/A	3.40	N/A

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

Legend

- 10% Tidal AEP Event
- 0.5% Tidal AEP Event
- 0.1% Tidal AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node ID Node Label

FINAL

REV:	NOTE:	DATE:
01	Amendments to Flood Extents.	05/12/16

EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

RPS

The Office of Public Works
Jonathan Swift Street
Trim
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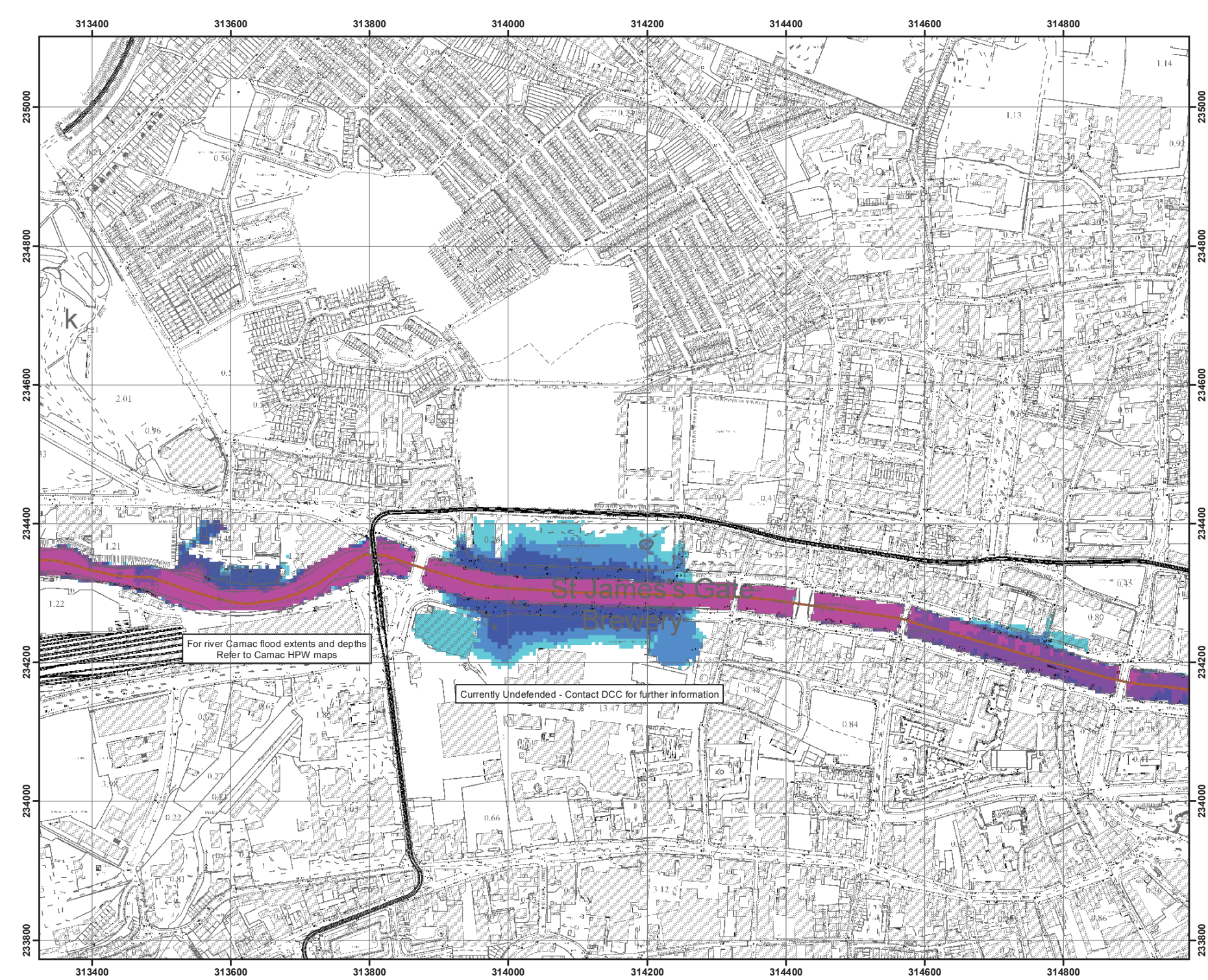
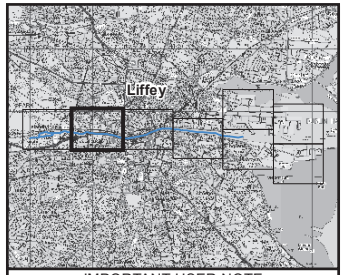
Map:
Liffey Tidal Flood Extents

Map Type:	EXTENT
Source:	TIDAL
Map Area:	COASTAL
Scenario:	CURRENT
Drawn By : C.C.	Date : 9 May 2017
Checked By : A.S.	Date : 9 May 2017
Approved By : S.P.	Date : 9 May 2017
Drawing No. :	E09LIF_EXCCD_F1_02
Map Series :	Page 2 of 8
Drawing Scale :	1:5,000 @ A3





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

Legend

0.1% Fluvial AEP Flood Depth

- 0 - 0.25m
- 0.25 - 0.5m
- 0.5 - 1m
- 1.0 - 1.5m
- 1.5 - 2m
- >2m

Modelled River Centreline

AFA Extents

FINAL

REV:	NOTE:	DATE:
01	Amendments to Flood Extents.	05/12/16

EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

RPS

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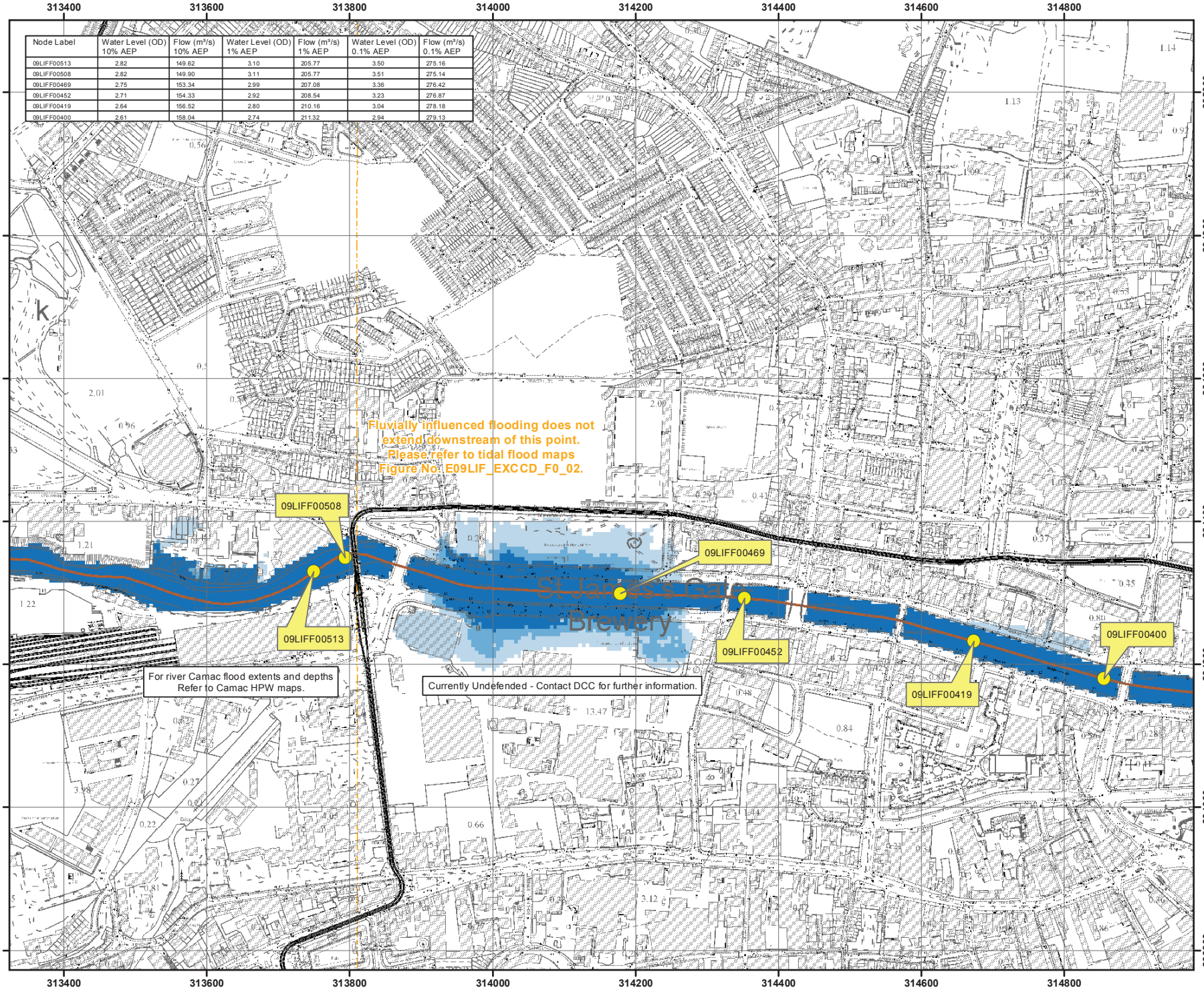
Map:
Liffey Fluvial Flood Depths

Map Type:	DEPTH
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By : C.McG.	Date : 9 May 2017
Checked By : A.S.	Date : 9 May 2017
Approved By : G.G	Date : 9 May 2017
Drawing No. :	E09LIF_DPFCD001_F1_02
Map Series :	Page 2 of 8
Drawing Scale : 1:5,000	@A3



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
09LIFF00513	2.82	149.62	3.10	205.77	3.50	275.16
09LIFF00508	2.82	149.90	3.11	205.77	3.51	275.14
09LIFF00469	2.75	153.34	2.99	207.08	3.36	276.42
09LIFF00452	2.71	154.33	2.92	208.54	3.23	276.87
09LIFF00419	2.64	156.52	2.80	210.16	3.04	278.18
09LIFF00400	2.61	158.04	2.74	211.32	2.94	279.13

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

Legend

- 10% Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node ID Node Label

FINAL

REV:	NOTE:	DATE:
01	Amendments to Flood Extents.	05/12/16

EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

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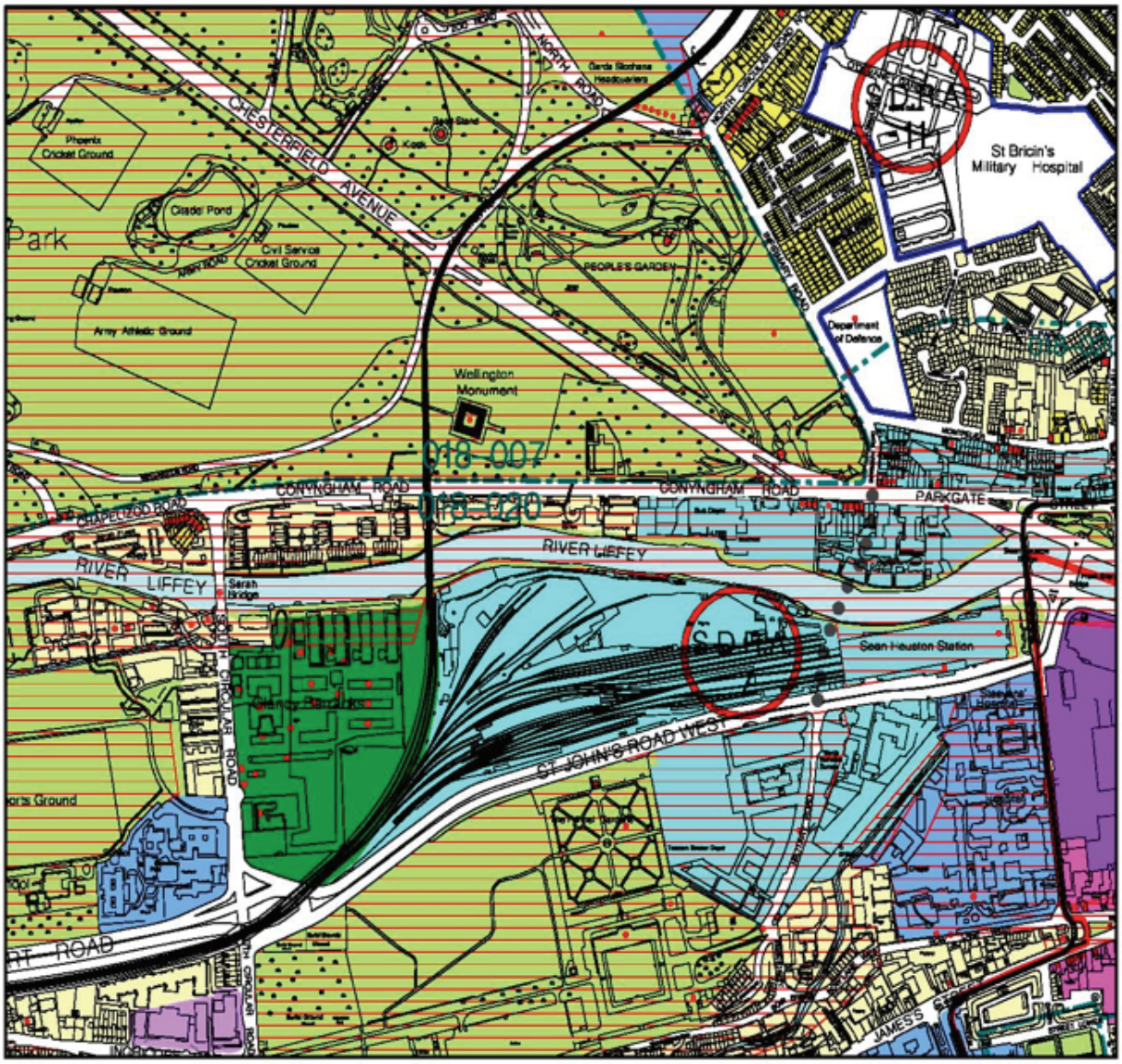
Map:
Liffey Fluvial Flood Extents

Map Type:	EXTENT
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By : C.C.	Date : 9 May 2017
Checked By : A.S.	Date : 9 May 2017
Approved By : S.P.	Date : 9 May 2017
Drawing No. :	E09LIF_EXFCD_F1_02
Map Series :	Page 2 of 8
Drawing Scale :	1:5,000 @ A3

Appendix D

The Plan Making Justification Test - Site 5. Liffey: Sean Heuston Bridge – Sarah Bridge, South Circular Road

Site: 5. Liffey: Sean Heuston Br. – Sarah Bridge, South Circular Road



Dublin City Council Development Plan 2016–2022 (zoning map key at back of tables)

Site Description	The area on the south side includes Heuston Station to St. John's Road West, Riverbank House at Clancy Quay, the Camac outfall tunnel to the Liffey Estuary, the south city interceptor sewer in the south bank of the Liffey Estuary and areas south of these. On the north side it includes Parkgate, Conyngham Road and developments between these and the river estuary. Development in this area is a mixture of Commercial and high density Residential. Heuston Station and Irish Rail Infrastructure are a major part of this area.
Benefitting from Defences (flood relief scheme works)	Some of this area has existing Quay Walls to ground level but their design standards and capacity for flood defence is unknown and is therefore not used when estimating flood risk. In addition, their capacity is limited to the channel dimensions. Existing embankments would also need to be assessed before any further development is carried out behind them.

Site: 5. Liffey: Sean Heuston Br. – Sarah Bridge, South Circular Road	
Sensitivity to Climate Change	Moderate to high – the river in this location has combined fluvial and tidal influences which could result in greater increases in water level than elsewhere.
Residual Risk	Not applicable as existing defences are the channel walls to ground level.
Historical Flooding	The flood maps attached are consistent with previous flooding of this section of the Liffey Estuary. The main flood risk zones are sections of the north and south quays adjacent to the Liffey Estuary and areas connected with the Camac River junction.
Storm (surface) water	All storm (surface) water in this area needs to be carefully managed and provision made for significant rainfall events during high tides. A one year high tide event should be assumed during a 100-year rainfall event. Should development be permitted, best practice with regard to storm (surface) water management should be implemented across the development area, to limit storm (surface) water runoff to current values. All Developments shall have regard to the Pluvial Flood Maps in their Site Specific Flood Risk Assessment, see Flood ResilienCity Project, Volume 2 City Wide Pluvial Flood Risk Assessment at http://www.dublincity.ie/main-menu-services-water-waste-and-environment-drains-sewers-and-waste-water/flood-prevention-plans

Commentary on Flood Risk: The flood extents indicate flow paths generally coming directly out of the tidal region, some are through quay walls and underground chambers and pipelines near quay walls. The flood maps were produced based on the OPW CFRAM Study and checked against historic flooding in the area. Flooding from the River Camac is discussed in its assessment area.

Development Options:
The main flood cells are located just north and south of the River Estuary, which is currently zoned for a mix of different zonings, including to the south of the river, Z15 which is to protect and provide for institutional and community uses, Z5 which is to consolidate and facilitate the development of the central area, and to identify, reinforce, strengthen and protect its civic design character and identity. Part of the lands around Kilmainham are zoned Z1 in the Plan which is to protect, provide and improve residential amenities. Part of the lands to the north of the Quays within Flood Zone A would be zoned Z5 in the Plan (see above). No new development should be allowed in these green areas. Irish Rail developments should have cognisance of current estuary planning levels. All existing embankments should be evaluated for new developments behind them. New bridges and tunnels should be evaluated for critical sea level rises.

High density Commercial, Industrial, Infrastructural and Residential development (some infill) would be a natural extension of existing development. However, any development could reasonably be accommodated within the extents of Flood Zone C and should not need to extend into Flood Zone A or B.

Site: 5. Liffey: Sean Heuston Br. – Sarah Bridge, South Circular Road

Justification Test for Development Plans

1. Section 1 is covered elsewhere in this SFRA Justifying all of Dublin City

2. The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular:

(i) **Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement**
Answer: Yes: This area forms part of the central area of the City. The lands form part of an established built up part of the City close to Strategic Rail Infrastructure. The area around Heuston is identified as Strategic Development and Regeneration Area (SDRA 7 Heuston & Environs; See section 15.1.1.10 of the Written Statement) under the Core Strategy, which are important brownfield sites with the potential to deliver a significant quantum of mixed-uses and create synergies to regenerate their respective areas. An urban design land use framework plan for the regeneration of the Heuston area was produced in 2003. Since the publication of the 2003 report this area has undergone significant redevelopment, including much of the Heuston South Quarter and development at Clancy Barracks. A number of significant land banks still remain to be developed and for these the guiding principles have been set out in section Chapter 15 of the Written Statement.(see section 15.1.1.10 of the written statement)

(ii) **Comprises significant previously developed and/or under-utilised lands**
Answer: Most of the lands within Flood Zone A and B are already built up or comprise of brownfield sites.

(iii) **Is within or adjoining the core of an established or designated urban settlement**
Answer: Yes: This area forms part of the Central Core of the City.

(iv) **Will be essential in achieving compact and sustainable urban growth**
Answer: Yes: This area is essential to achieving compact and sustainable urban growth.

(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
Answer: There are no suitable alternative lands for the particular uses or development type in areas at lower risk of flooding, within or adjoining the urban settlement. Areas idenitifed as being in Flood Zones A and B are considered essential to achieving a consolidated urban centre and to comply with the NSS and RPG.

Site: 5. Liffey: Sean Heuston Br. – Sarah Bridge, South Circular Road

3. Strategic Flood Risk Assessment for Flood Zones A and B (for defended Flood Zones A and B see section 4.8)

- To a large extent the areas indicated as being within Flood Risk Areas are generally built out or are existing brownfield sites and the opportunities for future development are limited. The extents of Flood Zone A and B are not significant along much of this reach of the Liffey, with most flood risk arising from the River Camac.
- There are a number of identified flood cells along this stretch of the River Liffey, and cover areas currently zoned Z5 which is to consolidate and facilitate the development of the central areas and to identify, reinforce and strengthen and protect its civic design character and dignity. There are some areas zoned Z1 which is to protect, provide and improve residential amenities.
- Given the combined tidal and fluvial influences in this section of the River Liffey, a joint probability assessment should be carried out to determine finished floor levels. The assessment should take into account the combined impacts of a peak tide and a peak flow occurring at the same time. Given that an event such as this would have a greater rarity that either event occurring individually a pragmatic approach should be taken to applying the findings. For example, whilst it would be appropriate to consider joint probability levels in the redevelopment of brown field sites, for individual or infill developments such allowances may prohibit connection with the existing streetscape.
- The River Camac is currently subject to assessment under the Eastern CFRAM Study, which is reviewing the need for, and potential options to manage flood risk. Development at the downstream end of the Camac (around Heuston Station and St. James's Gate) should take into account the findings of the CFRAM Study. In this regard, until the Flood Risk Management Plan has been published, and any recommendations implemented, large scale development in this area should be proceeded with caution.
- FRA's should be carried out for all basements and underground structures with respect to any human access.

Appendix E

Statement of Consistency

Ruirside Developments Limited

Parkgate Street Development

Statement of Consistency with Ministerial Guidance

Issue | 7 June 2019

Job number 265381-010

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ARUP

Contents

1 Statement

This statement of consistency confirms the following:

- The Site Specific Flood Risk Assessment will form part of the Planning Application documentation to An Bord Plenála and will be prepared in accordance with the Planning System and Flood Risk Management Guidelines for Planning Authorities (2009).
- The Site Specific Flood Risk Assessment will also be in accordance with the recommendations in the Strategic Flood Risk Assessment produced as part of the Dublin City Development Plan 2016-2022.

2 Site Specific Flood Risk Assessment

The Site-Specific Flood Risk Assessment (SSFRA) will address the following:

- Review of all relevant information and data from;
    - The Office of Public Works (OPW) Preliminary Flood Risk Assessment Mapping (PFRA);
    - Eastern Catchment Flood Risk Assessment and Management (CFRAM) Study;
    - The Dublin City Council Development Plan 2016-2022;
    - Any historic flood information for the area and/or any relevant studies.
- Review of available site investigation data;
- Review of the risk of coastal, fluvial, pluvial and groundwater flooding; and
- Preparation of a Flood Risk Assessment Report.