

Project

Residential Development at Newcastle South, Co. Dublin

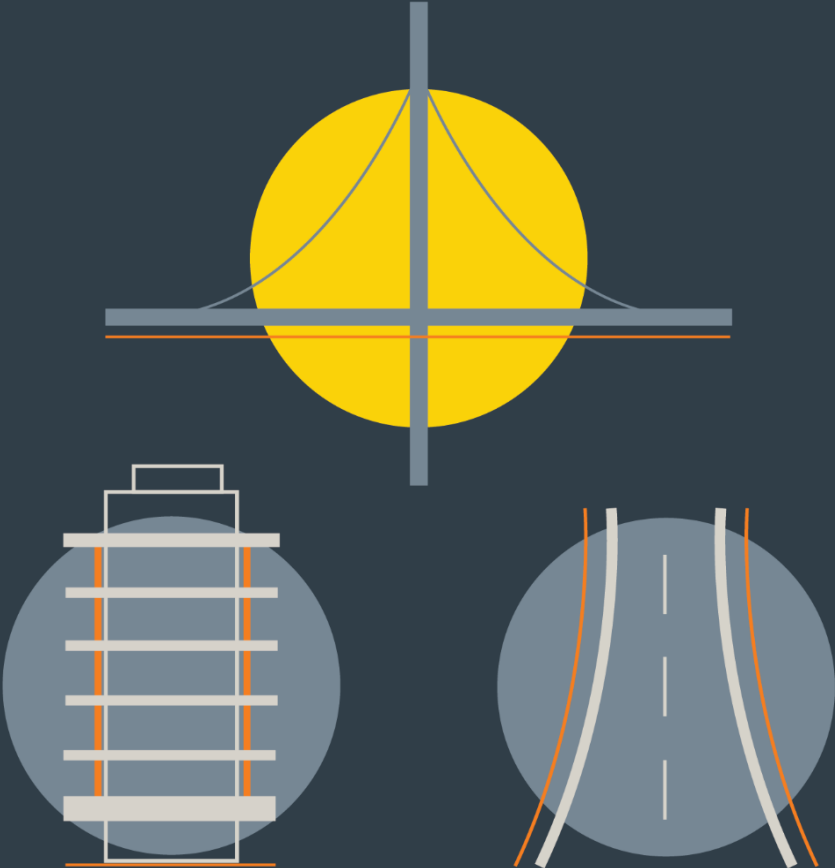
Report Title

Site Specific Flood Risk Assessment

Client

Cairn Homes Properties Ltd.

INFRASTRUCTURE



DBFL CONSULTING ENGINEERS

June 2022

Job Title: Residential Development at Newcastle South, Co. Dublin.

Report Title: Site Specific Flood Risk Assessment

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TABLE OF CONTENTS

1.0 INTRODUCTION	1
1.1 Background	1
1.2 Objectives.....	1
1.3 Flood Risk Assessment Scope	1
1.4 Approach	1
1.5 Existing Site.....	1
1.6 Proposed Development.....	3
2.0 PLANNING SYSTEM & FLOOD RISK MANAGEMENT GUIDELINES .5	
2.1 General.....	5
2.2 Flood Risk Assessment Stages	5
3.0 FLOOD RISK IDENTIFICATION STAGE	7
3.1 General.....	7
3.2 Information Sources Consulted.....	7
3.3 Source-Pathway-Receptor Model	10
4.0 INITIAL FLOOD RISK ASSESSMENT STAGE	12
4.1 Initial Fluvial Flood Risk Assessment.....	12
4.2 Initial Pluvial Flood Risk Assessment.....	12
4.3 Flood Zone Category	12
5.0 DETAILED FLOOD RISK ASSESSMENT STAGE	13
5.1 General.....	13
5.2 Surface Water Management	13
5.3 Flood Exceedance.....	14
5.4 Impact on Adjacent Areas	14
5.5 Climate Change.....	15
5.6 Sustainable Urban Structure	15
5.7 Residual Risks.....	15
5.8 Risk of downstream flooding due to proposed development	15
5.9 Mitigation Measures	16
6.0 CONCLUSIONS	17

APPENDICES

- Appendix A . PROPOSED SCHEME LAYOUT
- Appendix B . OPW FLOOD HAZARD WEBSITE REPORT
- Appendix C . PRELIMINARY FLOOD RISK ASSESSMENT MAP
- Appendix D . SDCC SFRA MAP
- Appendix E . FLOOD EXCEEDANCE LAYOUT

1.0 INTRODUCTION

1.1 Background

DBFL Consulting Engineers were commissioned by the applicant to prepare a Site-Specific Flood Risk Assessment (SSFRA) for a proposed residential development at Newcastle, Co. Dublin.

1.2 Objectives

The objectives of this report are to inform the planning authority regarding flood risk for the potential development of the lands. The report will assess the site and development proposals in accordance the requirements of “*The Planning System and Flood Risk Management Guidelines for Planning Authorities*”.

The report will provide the following;

- The site’s flood zone category.
- Information to allow an informed decision of the planning application in the context of flood risk.
- Appropriate flood risk mitigation and management measures for any residual flood risk

1.3 Flood Risk Assessment Scope

This SSFRA relates only to the application site. This report uses information obtained from various sources, together with an assessment of flood risk for the existing land and proposed development. The report follows the requirements of ‘*The Planning System & Flood Risk Management – Guidelines for Planning Authorities*’, (referred to as the *Guidelines* for the remainder of this report).

1.4 Approach

Chapter 2 of this report considers ‘*The Planning System & Flood Risk Management – Guidelines for Planning Authorities*’ as they relate to the proposed application.

Flood risk identification is presented in Chapter 3 and initial flood risk assessment in Chapter 4. A more detailed assessment of specific flood risk and residual risk relating to the proposed development is presented in Chapter 5.

Conclusions and recommendations are presented in Chapter 6.

1.5 Existing Site

The subject site, of approximately 8.47 hectares, is located to the south of the R120/Main Street at Newcastle Village. The site is bounded by the Graydon SHD

residential development currently under construction to the east, the Athgoe Road to the west, by single dwellings to the north and existing agricultural lands to the south. The St Finian's National School and Church is located to the north of the site. St Finian's Way residential development is also located to the north of the site.

The development lands form part of the Newcastle LAP 2012-2022, the South Dublin County Development Plan (2016-2022) and the Draft South Dublin County Council Development Plan 2022-2028. The Main Development is zoned 'to provide for new residential communities in accordance with approved planning schemes' (RES-N).

The proposed development site is predominantly greenfield and a construction compound has been constructed on the eastern area adjacent to the Graydon development as well as a construction access across the site from the Athgoe Road to the Graydon development lands. Existing boundaries within the site are predominantly hedgerows and fencing with some drainage ditches. The proposed creche is located in the previously permitted Graydon development.



Figure 1.1 – Site Location.

The overall topography of the Site falls from south to north as shown in Figure 1.2. A topographical survey of the site is provided as a background to the road layout drawings 210026-DBFL-RD-SP-DR-C-1101.



Figure 1.2 – Site Topography.

The subject site is in the Liffey catchment. The River Liffey is approximately 2.2km to the northwest of the subject site. The coast is approximately 20km to the east of the site.

1.6 Proposed Development

The development will consist of the construction of 280 no. dwellings and associated ancillary infrastructure on lands of c. 8.47 hectares (2 no. sites comprising main development site (8.4 ha.) and site relating to permitted creche c. 0.07 ha. in 'Graydon') as follows:

- A) 128 no. 2 storey houses (8 no. 2 bedroom houses, 94 no. 3 bedroom houses, 25 no. 4 bedroom houses and 1 no. 5 bedroom house);
- B) 116 no. apartments in 2 no. 5 storey buildings comprising (54 no. 1 bedroom apartments & 62 no. 2 bedroom apartments, all with terrace or balcony along with solar panels and green roofs at roof level as well as telecommunications infrastructure comprising 9 no. support poles on ballast mounts (to accommodate 1No. 2m 2G/3G/4G antenna & 1No. 5G antenna each) & 3 no. poles on lift overrun (to accommodate 2No. Ø0.3m Microwave links each at roof level of Apartment building B, together with associated equipment and cabinets/shrouds);

- C) 36 no. apartments/duplex apartments in 3 no. 3 storey buildings – (18 no. 2 bedroom apartments and 18 no. 3 bedroom duplex apartments) all with terrace;
- D) Amendment to permitted Creche (c. 518sqm) in 'Graydon' (ABP References: TA06S.305343 & ABP-305343-19) to now provide a Creche of c. 778 sq. m of 2 no. storeys;
- E) Open space, hard and soft landscaping (including public lighting & boundary treatment), communal open space for duplex apartments and apartments; along with single storey bicycle/bin stores and ESB substations;
- F) Vehicular access from the Athgoe Road from a new signalised junction along with upgrades to footpath and pedestrian crossing as well as provision of vehicular/pedestrian/cycle link to permitted 'Graydon' (TA06S.305343) 'Newcastle Boulevard' to the east, as well as 423 no. car parking spaces and 370 no. bicycle spaces and all internal roads, cycleways, green routes and paths;
- G) Provision of Surface water attenuation measures and underground attenuation systems, connection to water supply, and provision of foul drainage infrastructure as well as underground local pumping station to Irish Water specifications and all ancillary site development/construction/landscaping works.

2.0 Planning System & Flood Risk Management Guidelines

2.1 General

“The Planning System and Flood Risk Management Guidelines for Planning Authorities”, November 2009 and its Technical Appendices outline the requirements for a site specific flood risk assessment.

Residential development is classified as “highly vulnerable development” according to Table 3.1 of the Guidelines. Table 3.2 of the Guidelines indicates that the Sequential Approach mechanism requires this type of development to be in Flood zone C i.e. outside the 1000 year flood extents. (It may also be compatible within flood zone categories A and B but a Justification Test for development management is then required to determine this.)

2.2 Flood Risk Assessment Stages

This site specific flood risk assessment will initially use existing flood risk information to determine the flood zone category of the Site i.e. to check if the Guidelines Sequential Approach has been applied, see Figure 2.1 below for details.

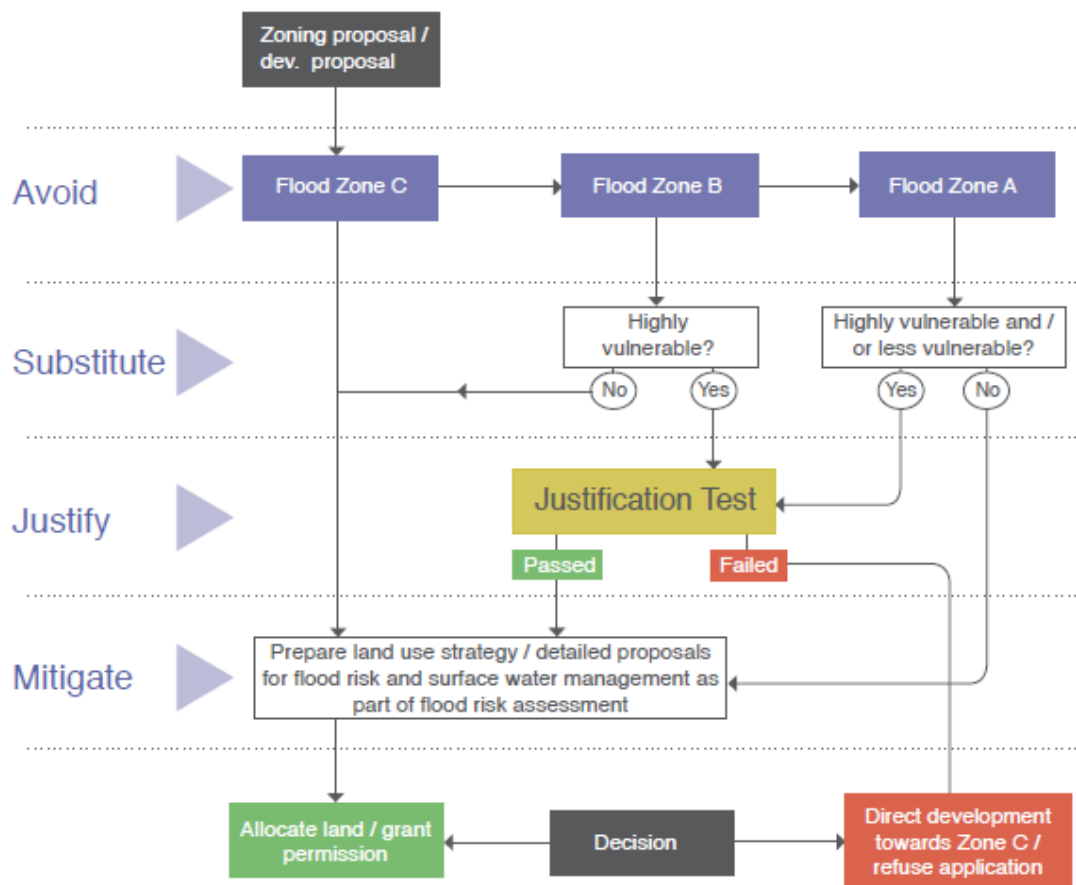


Figure 2.1 – Sequential Approach mechanism in the Planning Process

Flood risk is normally assessed by a flood risk identification stage followed by an initial flood risk assessment. A more detailed flood risk assessment stage then follows which includes an assessment of surface water management, flood risk and mitigation measures to be applied.

The following report sections outline the flood risk assessment stages for the proposed development which follow the requirements of the Guidelines' Technical Appendices.

3.0 Flood Risk Identification Stage

3.1 General

The initial flood risk identification stage uses existing information to identify and confirm whether there may be flooding or surface water management issues for the site that may warrant further investigation.

3.2 Information Sources Consulted

Information sources consulted for the identification exercise are outlined in table 3.1 below.

Information Source	Comments
Predictive and historic flood maps, and Benefiting Lands Maps, such as those at http://www.floodmaps.ie ;	OPW www.floodmaps.ie website consulted.
Expert advice from OPW who may be able to provide reports containing the results of detailed modelling and flood-mapping studies, including critical drainage areas, and information on historic flood events, including flooding from all sources;	Historic flood hazard maps and info obtained from OPW's floodmaps.ie website
Predictive fluvial flood maps.	Draft PFRA flood extents map consulted.
Previous Strategic Flood Risk Assessments;	Outside extents of Eastern CFRAM Study. South Dublin Development Plan Strategic Flood Risk Assessment consulted.
Topographical maps, in particular digital elevation models produced by aerial survey or ground survey techniques;	OSI Maps consulted & Site topographic survey undertaken.
Information on flood defence condition and performance;	No flood defence information available.
Alluvial deposit maps of the Geological Survey of Ireland (which would allow the potential for the implementation of source control and infiltration techniques, groundwater and overland flood risk to be assessed). These maps, while not providing full coverage, can indicate areas that have flooded in the past (the source of the alluvium) and may be particularly useful at the early stages of the FRA process where no other information is available;	GSI maps consulted.

Walkover survey to assess potential sources of flooding, likely routes for flood waters and the site's key features, including flood defences; and	Walkover survey conducted.
National, regional & local spatial plans, such as the National Spatial Strategy, regional planning guidelines, development plans & local area plans provide key information on existing and potential future receptors.	South Dublin County Council Development Plan and Newcastle LAP consulted. Draft South Dublin County Development Plan 2022-2028
Local Information & Local Libraries	Local landowner consulted
'Liable to flood' markings on the old '6 Inch' maps;	Historic OSI maps consulted.

Table 3.1 - Information sources consulted

3.2.1 OPW Predictive, Historic & Benefiting Lands Maps & Flood Hazard Information

From consultation of the OPW website www.floodmaps.ie there were no OPW land commission schemes or benefitting lands zones within the development boundary (see Appendix B for website report).

The OPW floodmaps.ie report highlighted 9 previous flood events within 2.5km of the subject site, although none of these flood events were identified as having caused flooding within the subject development lands.

3.2.2 Previous Strategic Flood Risk Assessments & Predictive Flood Maps

As part of the EU Floods Directive, the OPW is undertaking a Catchment Flood Risk Assessment and Management (CFRAM) Study. An initial part of this Study was a national Preliminary Flood Risk Assessment (PFRA) to identify areas at risk of significant flooding. The PFRA report and maps are available at www.cfram.ie and identify areas deemed to be at risk of flooding (referred to as Areas for Further Assessment, or 'AFAs'), as they require more detailed assessment on the extent and degree of flood risk by the later CFRAM Studies.

The PFRA maps for Newcastle are reproduced in Appendix C. The flood extents maps show no risk of fluvial, coastal or pluvial flooding on the subject site up to the 1% AEP (Annual Exceedance Probability) event.

The final CFRAM Fluvial Flood Extents Map, indicate that the subject site is outside the extents of the CFRAM Study.

The Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022 indicates that the subject site is located outside the extents of Flood Zone A and Flood Zone B and is therefore in Flood Zone C. A copy of the Fluvial Flood Zone Mapping is included in Appendix D. Draft South Dublin County Council Development Plan 2022-2028 also indicates that the subject site is located outside the extents of Flood Zone A and Flood Zone B and is therefore in Flood Zone C.

3.2.3 Tidal Flood Maps

Tidal flooding is not relevant to the Site as Newcastle is approximately 20km from the coast and more than 90m above sea level.

3.2.4 Other Sources

Other information sources were consulted to determine if there was any additional flood risk to the subject site, these included;

- Topographical surveys of the area – no evidence based on topography.
- Flood defences Information – no flood defence information available.
- Soil data from EPA and GSI – subsoils identified as tills derived from limestones.
- Groundwater information from GSI – no karst features or gravels identified in the site. Groundwater vulnerability varies across the site from Low to High and the bedrock aquifer is a locally important bedrock aquifer.
- Site Investigation Report – No evidence of flooding within the development lands.
- Walkover survey – No evidence of flooding within the development lands.
- Development Plan & Local Area plan – lands are zoned for residential development.
- Newcastle Local Area Plan (LAP) 2012 includes a flood map which highlights flood zones within the LAP boundary. The subject site is outside the extents of the flood zones and is classified as Flood Zone C.
- Existing Local Authority Drainage Records – existing 150mm to 525mm diameter surface water sewers are located in Newcastle along the R120 to the north of the subject site. A 225mm SW sewer is located along the Athgoe Road.
- Existing surface water infrastructure is provided as part of the Graydon development.

- Local Information & Local Authority Consultation – no evidence of flood risk to lands.
- Historic Maps – no evidence of flooding within the Site.
- Aerial Mapping – An overland flow route from a drainage ditch picked up on historic mapping which appear to correspond to a depression within the topography. This depression is described as a “pond” on the Newcastle LAP, 2012 in the south western area of the subject site. DBFL have reviewed this area on site and no pond was present but it appears there is a depression in this area of the site based on the topography. Some evidence of an overland flow route is present on historic aerial mapping.
- The SDCC report (ABP-311861-21) noted flooding downstream of the proposed outfall to the existing drainage ditch within the subject site.

3.3 Source-Pathway-Receptor Model

A Source-Pathway-Receptor model was produced to summarize the possible sources of floodwater, the people and assets (receptors) that could be affected by potential flooding (with specific reference to the proposals) and the pathways by which flood water for a 0.1%AEP (Annual Exceedance Probability) and 1%AEP storms could reach the receptors, see table 3.1. It provides the probability and magnitude of the sources, the performance and response of pathways and the consequences to the receptors in the context of the LAP development proposals. These sources, pathways and receptors will be assessed further by the initial flood risk assessment stage.

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Tidal	Tidal flooding from coast, 20km away, via Liffey River.		Remote		
Fluvial	Overbank existing streams, ditches and rivers to the south.	Future development including houses.	Low	Medium	Low
Surface Water Drainage (Pluvial)	Flooding from development's surcharging drainage systems	Future development including houses.	Possible	Medium	Moderate

Groundwater flooding	Rising GWL on the site		Remote		
Human or Mechanical Error (Pluvial)	New drainage network blocks	Areas of development draining to the surface water network	Possible	Medium	Moderate

Table 3.2 - Source-pathway-receptor analysis

4.0 Initial Flood Risk Assessment Stage

The only flood risks to the proposed residential development at the application site identified from Stage 1 are;

- A low risk of fluvial flood risk;
- Pluvial flood risk following development.

4.1 Initial Fluvial Flood Risk Assessment

The PFRA flood extents map identified no risk of fluvial flooding on the subject site up to the 1% AEP (Annual Exceedance Probability) event, (see PFRA maps in Appendix C).

Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022 indicates that the subject site is in Flood Zone C and is not affected by fluvial flooding. The flood risk maps are reproduced in Appendix D. The Draft South Dublin County Council Development Plan 2022-2028 also indicates the site is in Flood Zone C.

Historic mapping indicates there could be the potential for flood risk due to an overland flow route from a field ditch identified to the south of the subject site. The surface water drainage design prepared by DBFL includes a swale and culvert to convey this overland flow route to the existing ditch network. The swale and the culvert are designed to convey the 1:100 year flow plus an allowance of 20% for climate change.

4.2 Initial Pluvial Flood Risk Assessment

The Source-Pathway-Receptor model identified that there could be potential for pluvial flood risk within the LAP lands related to future drainage networks to serve the proposed development. These have potential to cause local flooding unless they are designed in accordance with the regulations e.g. GDSDS and to take account of flood exceedance e.g. for storms return periods over 1%AEP.

The Source-Pathway-Receptor model also identified that the proper operation and maintenance of the drainage system is necessary to reduce the risk of human or mechanical error causing pluvial flood risk from blockages etc.

4.3 Flood Zone Category

Following assessment of the flood risks to the Site and available flood data it is considered that the Site is within Flood Zone Category C as defined by the Guidelines. The residential type of development proposed is therefore appropriate for this flood zone category. The Guidelines Sequential Approach is therefore met and the 'Avoid' principal achieved.

5.0 Detailed Flood Risk Assessment Stage

5.1 General

Since the type of development proposed is appropriate for the Flood zone category of the Site, the detailed flood risk assessment stage will only consider pluvial flood risk in relation to the following;

- Proposed Surface Water Management measures.
- Flood Exceedance.
- Impact of proposals on flood risk to adjacent areas.
- Effects of climate change.
- Sustainable Urban Structure.
- Residual risks.
- Effectiveness of any flood mitigation measures.

5.2 Surface Water Management

The proposed storm-water proposals and drainage design for the development is generally a standard gully and pipe-work collection system with an attenuated outfall and associated attenuation storage. Surface water swales will be provided where possible to convey run-off from roads and cycle ways. Refer to Appendix A for proposed drainage layout.

The proposed new development will increase the impermeable area and run-off volume when compared with the existing green-field site. The new drainage system has the following features;

- Discharged flows are reduced to equivalent green-field run-off rates in accordance with the GDSDS.
- Attenuation storage is provided; in accordance with the GDSDS. Flows are restricted to greenfield run-off rates therefore this will mimic the undeveloped scenario which should mitigate flood risk to the receiving watercourses.

5.2.1 Sustainable Urban Drainage System Proposals

The SUDS proposals for the development include;

- Five attenuation facilities of which three have been designed as open ponds with 1:3 side slopes where possible to maximize the use of suds features and limit the requirement of underground tanks to promote biodiversity. The remaining two attenuation facilities have been designed as underground

stormtech attenuation systems with shallow detention basins to provide storage and promote infiltration. A total of 2,289m³ of surface water storage is provided within the attenuation facilities.

- Surface water swales to drain roads and cycle ways where possible.
- Permeable paving in all private driveways.
- Green roofs.
- Suds tree pits

5.2.2 Surface Water Attenuation and Storage

Storm-water attenuation for the development has been sized in accordance with the requirements of the GSDSDS. Run-off rates from the proposed development to the public system are also attenuated to existing green-field run-off rates as per the GSDSDS.

The total surface water storage volume available is in the region of 2,289m³ provided within the attenuation facilities. The total storage volume is based on the site's available outflow of 24.6 l/sec.

Details on the surface water drainage consultations between DBFL and South Dublin County Council Drainage department are detailed in Section 3.4 of the Infrastructure Design Report provided with the planning application documents.

5.3 Flood Exceedance

For storms greater than the 1%AEP pluvial event, the development's drainage network design will be exceeded and areas with low ground levels will begin to flood. Proposed road levels all fall towards the north towards the surface water drainage outfalls and existing ditches, see flood exceedance layout in Appendix E. This will ensure that the proposed residential units are protected from flooding when the drainage network may be exceeded.

Lowest house floor levels are set a minimum of 0.5m above the top water level in the corresponding attenuation facility in accordance with recommended minimum freeboards.

5.4 Impact on Adjacent Areas

Adjacent areas will not be impacted by the development for up to the 1%AEP flood event, however if larger storms >1%AEP exceed the capacity of the development's drainage system then overland flood routes may be directed towards the surface water drainage outfall to the north of the site and to the open space and drainage ditches within the site.

5.5 Climate Change

The potential impact of climate change has been allowed for as follows;

- Pluvial flood risk - drainage system and attenuation storage design allow for a 20% increase in rainfall intensities, as per SDCC requirements.

5.6 Sustainable Urban Structure

The development has been designed in accordance with the GSDSDS.

5.6.1 Access & egress during flood events

The access and egress arrangements for the main development site are via the Graydon development at Newcastle Boulevard to the east and the Athgoe Road to the west. Based on relevant fluvial flood levels from the CFRAMS, it is anticipated that for a 0.1% AEP flood event that the development can be safely accessed and exited through the proposed vehicular entrance.

5.7 Residual Risks

Remaining residual flood risks, following the detailed assessment include the following;

1. Pluvial flooding from the private drainage system related to a pipe blockage or from flood exceedance.
2. Pluvial flooding from the development's drainage system for storms in excess of the 100 year design capacity.
3. Fluvial flooding from the overland flow route identified on historic mapping.

5.8 Risk of downstream flooding due to proposed development

DBFL consulted with SDCC drainage department regarding their report (ref SHD2ABP-311861-21). There are two outfalls from the site. The majority of the site is routed to an existing drainage ditch on the site while a small portion enters an existing surface water network on Athgoe Road. The proposed drainage ditch discharges to the Old Glebe pond where it then follows an undefined network of drainage ditches. The proposed development will not increase the current risk of flooding to the Old Glebe. Run-off from the site is restricted to greenfield run-off rates which mimic the current scenario. The proposed scheme also allows for the provision of extensive SUDs proposal to attenuate storm-water runoff, reduce storm-water runoff, reduce pollution impact, replicate the natural characteristics of rainfall runoff for the site, recharge the groundwater profile.

The following measures will mitigate the risk of downstream flooding:

- Surface water runoff from the development will be attenuated to greenfield runoff rates (Q_{bar}) in accordance with the Greater Dublin Strategic Drainage Study (GSDS). This will mimic the undeveloped scenario which should mitigate flood risk to the receiving watercourses
- A total of 2,289m³ of surface water storage will be provided within the attenuation facilities to store surface water for storms between the 5, 30 year and the 100 year critical storms.
- In accordance with the GSDS it is proposed to use Sustainable Urban Drainage systems (SUDS) for managing storm-water for the proposed development. The aim of the SUDS strategy for the site will be to; attenuate storm-water runoff, reduce storm-water runoff, reduce pollution impact, replicate the natural characteristics of rainfall runoff for the site, recharge the groundwater profile. An extensive SUDS proposal is proposed as part of this application.

5.9 Mitigation Measures

Proposed mitigation measures to address residual flood risks are summarized below;

- M1. Proposed drainage system to be maintained on a regular basis to reduce the risk of a blockage.
- M2. In the event of storms exceeding the 100-year design capacity of the drainage system, then possible flood routing for overland flows towards the drainage outfalls should not be blocked.
- M3. The proposed culvert and swale shall be designed for the 1:100 year storm plus 20% allowance for climate change. The swale and culvert shall be maintained on a regular basis to reduce the risk of a blockage.

5.9.1 Effectiveness of Mitigation Measures

It is considered that the flood risk mitigation measures if implemented are sufficient to provide a suitable level of protection to the proposed development. A regularly maintained drainage system will ensure that it remains effective and in good working order should a large pluvial storm occur.

Should extreme pluvial flooding occur that is in excess of the development's drainage capacity i.e. probability less than 1%AEP, then overland flood routes to the drainage outfall could protect the development and houses with lower floor levels.

The proposed culvert and swale will provide a suitable level of protection to the proposed development from the existing drainage ditch.

6.0 Conclusions

The Site Specific Flood Risk Assessment for the proposed development was undertaken in accordance with the requirements of the Planning System and Flood Risk Management Guidelines for Planning Authorities”, November 2009.

Following the flood risk assessment stages it was determined that the Site is within Flood Zone C as defined by the Guidelines.

It is concluded that the;

- Residential development proposed is appropriate for the Site's flood zone category.
- Planning System and Flood Risk Management Guidelines Sequential Approach is met and the 'Avoid' principal achieved.
- A Justification Test is not required as the site is in Flood Zone C.

The development was concluded as having a good level of flood protection up to the 100 year return event. For pluvial floods exceeding the 100 year capacity of the drainage system then proposed flood routing mitigation measures are recommended.

Appendix A
PROPOSED SCHEME LAYOUT

Appendix B
OPW FLOOD HAZARD WEBSITE REPORT

Past Flood Event Local Area Summary Report

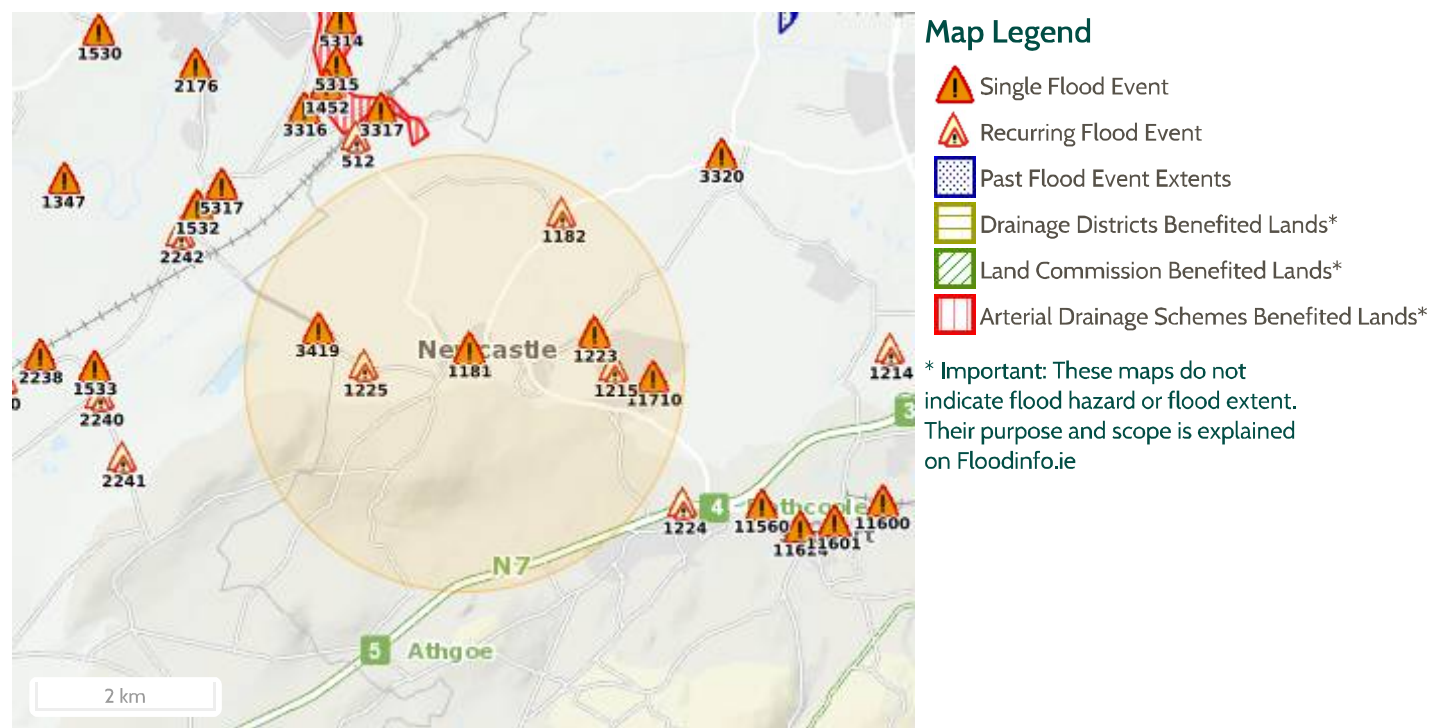


OPW Oifig na nOibreacha Poiblí
Office of Public Works

Report Produced: 4/10/2021 11:12

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

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



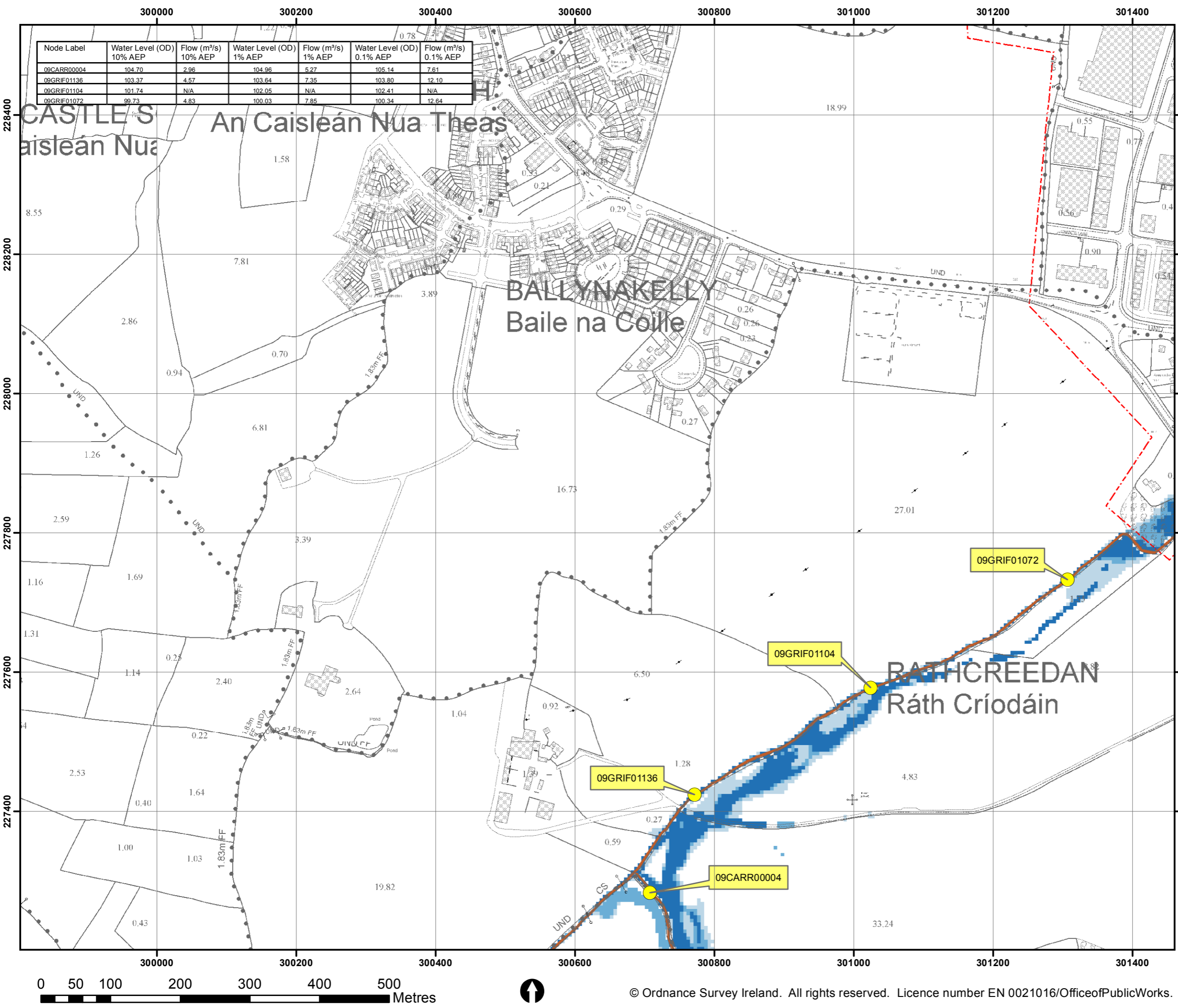
9 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Newcastle Glebe Dublin Recurring (ID-1181) Additional Information: Reports (2) Press Archive (0)	n/a	Approximate Point
2.	Peamount Road Recurring (ID-1182) Additional Information: Reports (2) Press Archive (1)	n/a	Approximate Point
3.	Newcastle Greenoge Recurring (ID-1215) Additional Information: Reports (2) Press Archive (0)	n/a	Approximate Point
4.	Aylmer Road Newcastle recurring (ID-1223) Additional Information: Reports (2) Press Archive (1)	n/a	Approximate Point
5.	Aylmer Road Newcastle Nov 2000 (ID-3319) Additional Information: Reports (2) Press Archive (1)	05/11/2000	Approximate Point
6.	Newcastle village Nov 2000 (ID-3325) Additional Information: Reports (1) Press Archive (0)	05/11/2000	Approximate Point

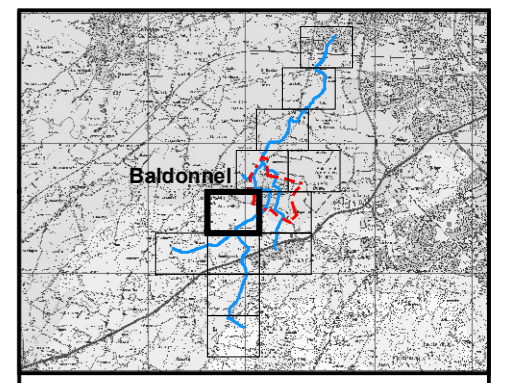
Name (Flood_ID)	Start Date	Event Location
7.  Lyons Demesne Access Nov 2000 (ID-3419) Additional Information: Reports (2) , Press Archive (0)	05/11/2000	Approximate Point
8.  Lyons Road Recurring (ID-1225) Additional Information: Reports (2) , Press Archive (0)	n/a	Approximate Point
9.  Flooding at Greenogue Business Park, Rathcoole, Co. Dublin on 24th Oct 2011 (ID-11710) Additional Information: Reports (1) , Press Archive (0)	24/10/2011	Exact Point

Appendix C

PRELIMINARY FLOOD RISK ASSESSMENT (PFRA) MAP EXTRACT OPW



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
09CARR00004	104.70	2.96	104.96	5.27	105.14	7.61
09GRIF01136	103.37	4.57	103.64	7.35	103.80	12.10
09GRIF01104	101.74	N/A	102.05	N/A	102.41	N/A
09GRIF01072	99.73	4.83	100.03	7.85	100.34	12.64



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:
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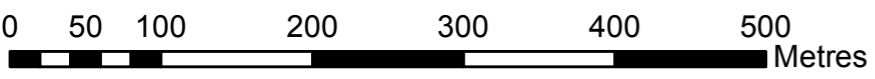


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Map: Baldonnel Fluvial Flood Extents
Map Type: EXTENT
Source: FLUVIAL
Map Area: HPW
Scenario: CURRENT
Drawn By: C.C. Date: 21 July 2016
Checked By: D.I. Date: 21 July 2016
Approved By: G.G. Date: 21 July 2016
Drawing No.: E09BAL_EXFCD_F0_05
Map Series: Page 5 of 12
Drawing Scale: 1:5,000 @ A3



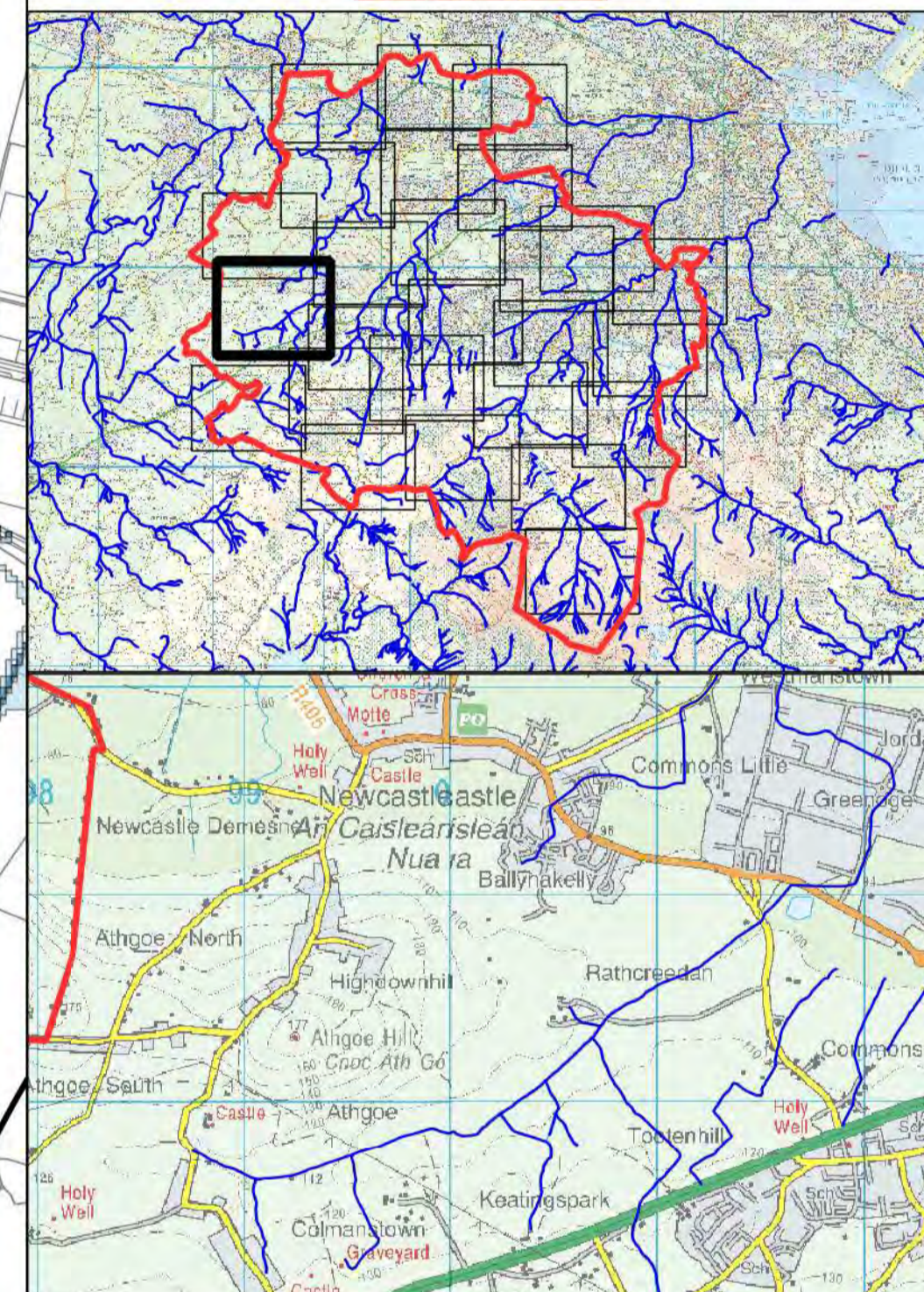
Appendix D
SDCC DEVELOPMENT PLAN SFRA



Legend

- Flood Zone A - 1% AEP Flood Extent (1 in 100 chance in any given year)
- Flood Zone B - 1% AEP Flood Extent (1 in 1000 chance in any given year)
- Defended Area
- Watercourse Centreline
- Indicative Flood Extents
- County Boundary

DRAFT



Project Strategic Flood Risk Assessment

Title Fluvial Flood Zone Mapping

Figure MDW657_0013



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Issue Details

Drawn:	BT	Project No.	MDW0657
Checked:	JH	File Ref	MDW0657QG0010F02
Approved:	JH	Drawing No.	13 of 26
Scale:	1:6000 @ A1	Projection	IG
Date:	14/01/2016		

- Notes**
1. The viewer of this map should refer to the SFRA Report and Disclaimer
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Appendix E
FLOOD EXCEEDANCE LAYOUT

Scale: 1:1000

NOTES:

- ALL DRAWINGS TO BE CHECKED BY CONTRACTOR ON SITE AND ENGINEER INFORMED OF DISCREPANCIES BEFORE WORK COMMENCES.
- ALL DIMENSIONS AND LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
- ALL LEVELS ARE IN METRES AND ARE RELATED TO ORDNANCE DATUM. CO-ORDINATES RELATE TO NATIONAL GRID.
- CONTRACTOR SHALL BATHY-METRE AS TO THE ACCURACY OF PRESENT LEVELS ON SITE PRIOR TO COMMENCEMENT OF WORKS ON SITE.
- ALL WASTEWATER INFRASTRUCTURE INCLUDING FOUL SEWERS, CONNECTIONS AND MANHOLES TO SAME SHALL COMPLY WITH AND BE CONSTRUCTED IN ACCORDANCE WITH THE HIGH WATER CONNECTION AND DEVELOPER SERVICES WASTEWATER INFRASTRUCTURE STANDARD DETAILS DOCUMENT IN DIS-003.
- FOUL SEWERS PIPE MATERIAL TO BE IN ACCORDANCE WITH SECTION 11 OF THE HIGH WATER CONNECTION PRACTICE WHICH IS REPRODUCED IN SPECIFICATION APPENDIX 51.
- SURFACE WATER SEWERS SHALL BE CONSTRUCTED TO CLASS 4 CONCRETE TO EN 1245 & S 2004 IN ACCORDANCE WITH THE GREATER BIRMINGHAM LOCAL AUTHORITY PRACTICE FOR DRAINAGE WORKS.
- LOCATION AND DEPTHS OF EXISTING MANHOLES AND OUTFALL POINTS TO BE VERIFIED BY CONTRACTOR PRIOR TO COMMENCEMENT OF DRAINAGE WORKS.
- ALL COVER LEVELS TO MATCH FINISHED ROAD/VERGEE/PATH/CYCLETRACK LEVELS UNLESS OTHERWISE STATED.
- ALL SURFACE WATER DRAINAGE WORKS CONNECTIONS TO COMPLY WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY.
- CONTRACTOR TO INCLUDE FOR CCTV SURVEY OF ALL FOUL & SURFACE WATER SEWERS DRAINAGE UPON COMPLETION OF SAME.
- MANHOLE COVERS IN LANDSCAPED AREAS TO BE SURROUNDED BY A CONCRETE SLAB WITH 200mm ROUNDED AND 100mm DEEP FORMED WITH C20/25 CONCRETE 10MM AGGREGATE SIZE BEDDED IN CLASS 6A MATERIAL.

Flood Exceedance Route Map



Legend

Overland Flow Route →

Legend items include: PROPOSED SITE BOUNDARY, EXISTING SURFACE WATER SEWER AND MANHOLE, PROPOSED SURFACE WATER SEWER AND MANHOLE, PROPOSED SURFACE WATER DETENTION CHAMBER AND 150mm² UPVC HOUSE DRAIN ROAD GULLY, PROPOSED SUEW CONNECTION TO TREE PIT, PERMEABLE PAVING (PRIVATE), PERMEABLE PAVING (MANHOLES/CHAMBER), PROPOSED FILTER DRAIN WITH SURFACE WATER SWALE, EXISTING FOUL SEWER, PROPOSED FOUL SEWER AND MANHOLE, PROPOSED FOUL WATER RECEPTION CHAMBER (STD-100-13) AND 100mm² HOUSE DRAIN, PROPOSED 160mm OD PE100 FOUL RISING MAIN, SERVICES DIRECTION DISTANCE/ANGLE, EXISTING LEVELS, FINISHED FLOOR LEVEL, GREEN ROOF SEDUM BLANKET OR SIMILAR APPROVED, SEE INLET KEYS.



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PROJECT: NEWCASTLE SOUTH
DRAWING TITLE: PROPOSED DRAINAGE LAYOUT

DESIGNED BY: [Name]
CHECKED BY: [Name]
DATE: [Date]

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Scale: 1:500
Sheet Size: A3
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