Project

Strategic Housing Development at Colpe West, Drogheda, Co. Meath

Report Title

Site Specific Flood Risk Assessment (SSFRA)

Client

Shannon Homes Drogheda

INFRASTRUCTURE

DBFL CONSULTING ENGINEERS

October 2019

Job Title: **Strategic Housing Development at Colpe West, Drogheda, Co.Meath**

Job Number: **170092**

Report Title: **Site Specific Flood Risk Assessment (SSFRA)**

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Draft	04.10.2019	SHD Stage 3	DCG	DMW	DMW
Final	11.10.2019	SHD Stage 3	DCG	DMW	DMW

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1.0 INTRODUCTION

1.1 Background

DBFL Consulting Engineers were commissioned to undertake a "*Site Specific Flood Risk Assessment*" (SSFRA), in accordance with "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" (FRM Guidelines) for the proposed development of lands at Colpe West, Drogheda, Co. Meath. The application is under consideration through the SHD (Strategic Housing Development) planning process, with An Bord Pleanala.

The subject site is located to the east of the Dublin-Belfast railway line, to the north east of Colpe Road and to the west of Mill Road. Refer to *Figure 1* below for the site location map. The coast is approximately 4km to the east. The subject site is within lands which are the subject of a Framework Plan (*"Mill Road / Marsh Road Urban Design Framework Plan 2017")* and are also within lands included in the *"Local Area Plan for the Southern Environs of Drogheda 2009-2015"*.

Figure 1: Location of Subject Site

1.2 Proposed Development

The proposed development comprises 357 residential units (169 no. houses, 52 no. duplex units, and 136 no. apartments), a childcare facility and associated infrastructure including a link street on a site area of circa 13ha. The application also seeks to amend a link street approved under Meath County Council Planning Reference LB180620 (commercial development and link street through the "Mill Road / Marsh Road Framework Plan lands").

The lands at Mill Road / Marsh Road (including the subject site) have been identified for development in the "*Local Area Plan for the Southern Environs of Drogheda, 2009-2015"*, with future development subject to the *"Mill Road / Marsh Road Urban Design Framework Plan 2017"*. An extract of the LAP zoning for the lands is included in *Figure 2* below. The Residential Development is proposed within the "A2" lands, which is zoned to provide for new residential communities with ancillary community facilities, neighbourhood facilities and employment uses as considered appropriate for the status of the centre in the Settlement Hierarchy.

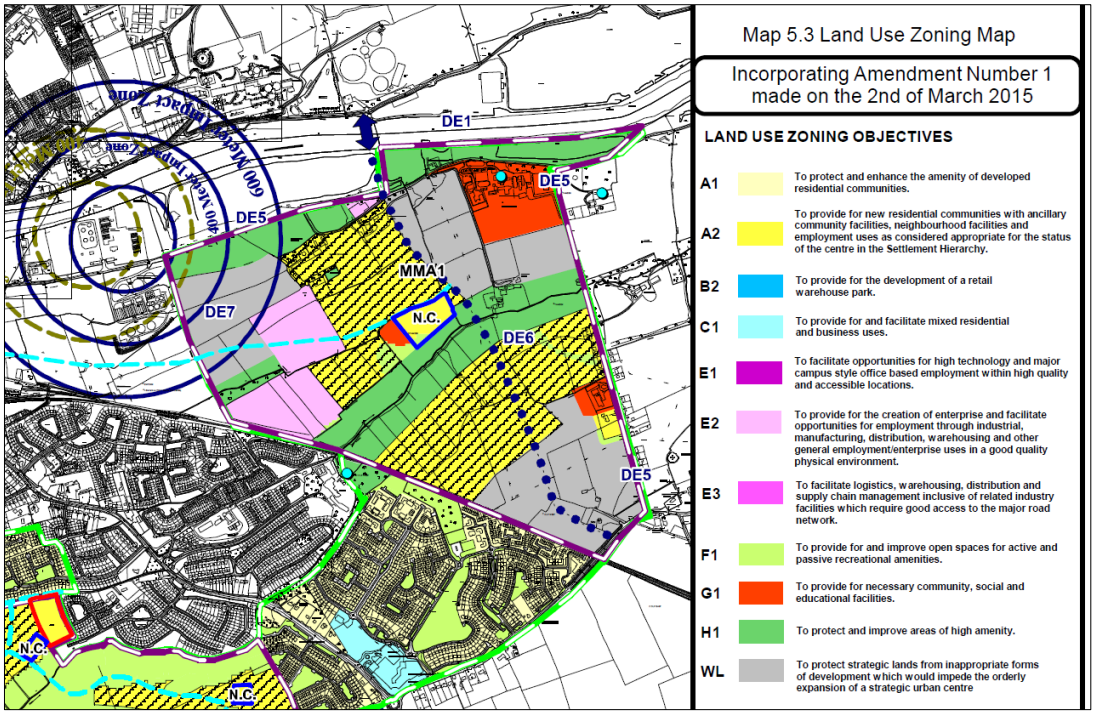


Figure 2: Extract of Land Use Zoning Map for "LAP for the Southern Environs of Drogheda"

1.3 Objectives

The objective of this report is to inform the planning authority regarding flood risk for the proposed residential development. This report assesses the lands and zoning proposals in accordance with the requirements of "*The Planning System and Flood Risk Management Guidelines for Planning Authorities"*. This report clarifies the lands flood zone category and presents information which would facilitate an informed decision of the planning application in the context of flood risk.

2.0 PLANNING GUIDELINES & FLOOD RISK ASSESSMENT

2.1 The Planning System and Flood Risk Management, Guidelines for Planning Authorities

The FRM Guidelines provide "mechanisms for the incorporation of flood risk identification, assessment and management into the planning process….". They ensure a consistent approach throughout the country requiring identification of flood risk and flood risk assessment to be key considerations when preparing development plans, local area plans and planned development.

"The core objectives of The FRM Guidelines are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water run-off;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure the requirements of EU and national law in relation to the natural environment and nature conservation are complied with for flood risk management."

The key principles of The FRM Guidelines are to apply the Sequential Approach (refer to Figure 3 below) to the planning process i.e.

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

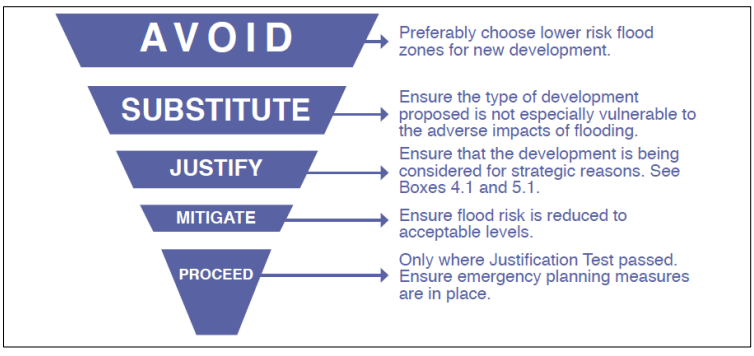


Figure 3: Sequential Approach Principles in Flood Risk Management (Extracted from FRM Guidelines)

Where the *Sequential Test's* avoid and substitute principals are not appropriate then the FRM Guidelines allow a *Justification Test* be applied to assess appropriateness or otherwise of particular

developments that, for the reasons outlined above are being considered in areas of moderate or high flood risk.

2.2 Flood Risk Assessment

2.2.1 General

The assessment of flood risk requires an understanding of where water comes from (the source), how and where it flows (the pathways) and the people and assets affected by it (the receptors).

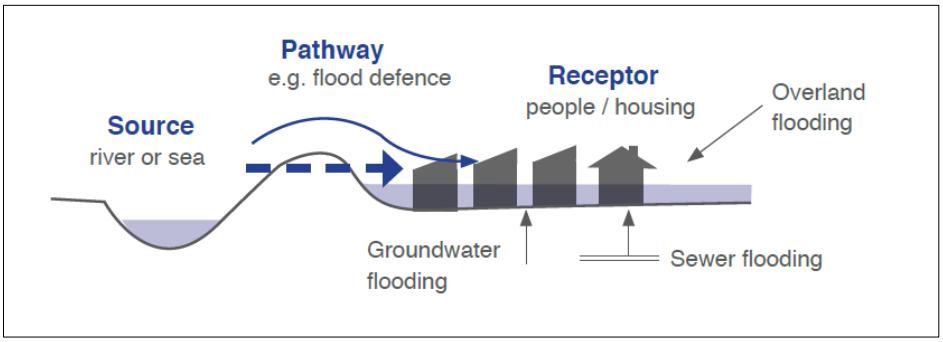


Figure 4: Source-Pathway-Receptor Model (Extracted from FRM Guidelines)

The principal sources are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets. The receptors can include people, their property and the environment. All three elements are examined as part of the flood risk assessment including the vulnerability and exposure of receptors to determine potential consequences. Mitigation measures typically used in development management can reduce the impact of flooding on people and communities e.g. by blocking or impeding pathways. The planning process is primarily concerned with the location of receptors and potential sources and pathways that might put those receptors at risk.

Risks to people, property and the environment should be assessed over the full range of probabilities, including extreme events. Flood risk assessment should cover all sources of flooding, including effects of run-off from development locally and beyond. (Refer to Figure 4 above).

2.2.2 Flood Risk Assessment Stages

The FRM Guidelines outline that a staged approach should be adopted when carrying out a flood risk appraisal or assessment. The stages of appraisal and assessment are:

- *Stage 1 Flood risk identification* – to identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and LAP's or a proposed development site that may warrant further investigation at the appropriate lower level plan or planning application levels;
- *Stage 2 Initial flood risk assessment* – to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped; and
- *Stage 3 Detailed flood risk assessment* – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

This SSFRA comprises Stages 1, 2 and 3 involving both identification and more detailed assessment of flood risks and surface water management related to the planned development. A Strategic Flood Risk Assessment (SFRA) was carried out for County Meath, in support of the *Meath County Development Plan, 2013-2019*. This identified flood risk areas in the plan areas and highlighted that Drogheda Southern Environs is impacted by the Stameen River which outfalls to the River Boyne in Mornington. It also identifies the North-Eastern corner of the Southern Environs lands which is bounded by the tidal River Boyne which presents fluvial and tidal flood risk to this section of the lands.

A Strategic Flood Risk Assessment (SFRA) was carried out by DBFL Consulting Engineers in support of the *Mill Road / Marsh Road Urban Design Framework Plan 2017.* This identified the main sources of fluvial flood risk in the area as being from the River Boyne / Boyne Estuary to the north of the plan lands, the Irish Sea approximately 3.8km east of the lands, and the Stameen River which traverses the centre of the plan lands.

Lands which are identified as being subject to flood risk have been re-zoned to an appropriate use, F1 '*To provide for and improve open spaces for active and passive recreational amenities*' land use zoning objective, in the *County Development Plan 2013-2019 (Drogheda Southern Environs)*, the Southern environs and the M*ill Road / Marsh Road Urban Design Framework Plan 2017*. This land use zoning is categorised as water compatible development in the FRM Guidelines and is therefore suitable to flood Zones A and B.

2.3 Flood Zones

The FRM Guidelines use flood zones to determine the likelihood of flooding and for flood risk management within the planning process. The three flood zones levels are:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest 1% AEP (Annual Exceedance Probability) for rivers and 0.5% AEP for coastal;
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% AEP or 1 in 1000 and 1% AEP or 1 in 100 for river flooding); and
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas outside zones A and B.

The FRM Guidelines categorises all types of development as either;

- Highly Vulnerable e.g. dwellings, hospitals, fire stations, essential infrastructure,
- Vulnerable e.g. retail, commercial or industrial buildings, local transport infrastructure,
- Water Compatible e.g. flood infrastructure, docks, amenity open space.

2.4 Vulnerability v Flood Zone

The FRM Guidelines outlines a sequential approach to planning as a key tool in ensuring that development is directed towards land that is at low risk of flooding. The Sequential Approach restricts development types to occur within the flood zone appropriate to their vulnerability class, as outlined below in Table 1. Alternatively, a Justification Test can be completed to justify development in higher risk areas, (refer to Figure 5 below).

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 1 Matrix of Vulnerability versus Flood Zone to illustrate where development appropriate for flood zone or where justification test required (Extract from FHM Guidelines)

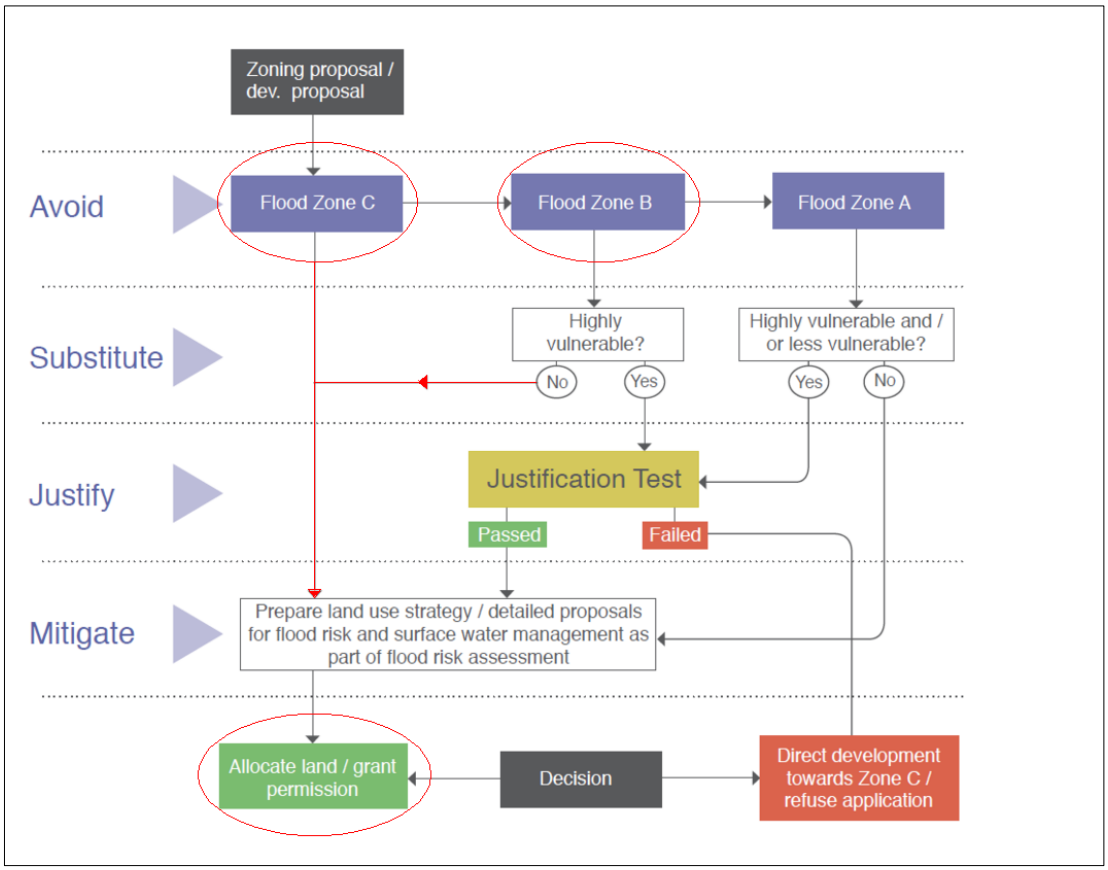


Figure 5: *Sequential Approach & Justification Test Mechanism in the Planning Process (FRM Guidelines)*

The proposed development is classified as a highly vulnerable development (residential and essential infrastructure) in the Guidelines. This class is appropriate to flood zone 'C'.

3.0 FLOOD RISK IDENTIFICATION

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 subject site which may warrant further investigation.

3.2 Available Information

The data sources consulted to identify potential flood risks for the subject site, are in Table 2.

	Information Source	Coverage	Quality	Confidence
Primary Data Source & Modelled Data	Strategic Flood Risk Assessment for Mill Road/ Marsh Road Urban Design Framework Plan 2017	Mill Road/Marsh Road Framework Plan Lands	High	High
	OPW ECFRAMS 2016	Nationwide	High	High
	Strategic Flood Risk Assessment for County Meath 2012	County Meath	Moderate	Moderate
	ICPSS 2011/2012	Nationwide	High	High
	OPW PFRA 2011	Nationwide	Moderate	Moderate
	OPW FEM FRAMS 2011	Fingal & East County Meath	High	High
Secondary Data Source	Walkover Survey	Site	Varies	Varies
	OPW Historic Flood Records & Benefitting Lands	Nationwide	Varies	Varies
	Historic OSI Maps	Local	Moderate	Low
	OPW Floodmaps & Historic Flood Events	Nationwide	Varies	Varies
	EPA Website	Nationwide	Moderate	Moderate
	Geological Survey Ireland	Nationwide	Moderate	Low
	MCC Drainage Records	County	Moderate	Moderate
	Topographic Survey	Local	Moderate	Low

Table 2: Available Flood Risk Information

The primary data sets used were the final ECFRAMS Fluvial and Tidal Flood Extents, The Irish Coastal Protection Strategy (ICPSS) and the Fingal East Meath Flood Risk Assessment and Management Study (FEMFRAMS). These sources produced detailed flood zones and flood extents maps for the wider area.

3.3 Available Flood Zone Mapping

3.2.1 General

The Final ECFRAMS produced detailed current nationwide flood zone maps, which include the subject site. Similarly, the ICPSS produced detailed future flood zone maps along the coastline to address the future scenario. The flood extent maps associated with both studies identifies the resultant Flood zones, A, B and C. They will be the primary data source for identifying flood risk for the subject site.

Fingal County Council (FCC) along with project partners Meath County Council and the Office of Public Works (OPW), recognised the high levels of existing flood risk in the Fingal East Meath area. The FEMFRAMS project produced detailed current and future flood zone maps for the Fingal and East Meath Regional area, including the vicinity of the subject site. The FEMFRAMS project was one of three pilot studies carried out on behalf of the OPW to establish the approach for implementing the Floods Directive in Ireland. The FEMFRAMS study was completed in 2012. The FEMFRAMS maps only indicate tidal flooding at Bettystown and extending slightly to the Boyne Estuary. Therefore, the FEMFRAMS maps are not relevant to the subject site.

3.2.2 Flooding from un-modelled river reaches

The FEMFRAMS produced flood extent and flood zone maps for modelled watercourses and coastal areas only. However, flooding may also occur from other reaches or watercourses which were not mapped. Areas identified by the flood maps as not within Flood Zones A or B could still be at risk from flooding from un-modelled rivers or other sources such as;

- Surcharged urban drainage systems;
- Ponding rainwater;
- Groundwater;

3.2.3 Climate Change & Other Future Changes

Climate change was considered in the production of the ICPSS flood extent mapping.

3.4 Flood Risk Identification Summary

A review of each available information source was undertaken for the proposed development. A summary of the flood risks identified are detailed in Table 3 below.

Information Source	Identified Flood Risks	Flood Risk
Strategic Flood Risk Assessment (2017) In support of Mill Road Marsh Road Urban Design Framework Plan	No flooding identified within the site. Flooding identified adjacent to Marsh Road.	X
OPW ECFRAM (2016)	No flooding identified within the site.	X
Strategic Flood Risk Assessment for County Meath (2012)	No flooding identified within the site.	X
ICPSS (2011/2012)	No flooding identified within the site.	X
OPW PFRA (2011)	No flooding identified within the site.	X
FEM FRAMS (2011)	No flooding within the site.	X
OPW Historic Flood Records & Benefitting Lands	No records of flooding on the lands. Benefitting lands indicated.	X
Historic OSI Maps	No evidence of flooding from OSI. Existing streams noted on historic maps.	X
OPW Floodmaps & Historic Flood Events	Flooding on Marsh Road recurring and Colp West recurring but not within the subject site. Colpe west pluvial flooding due to localised low point in road.	X

Table 3 – Review of Available Information Source

3.5 Identified Flood Risks/Flood Sources

3.5.1 Previous Strategic Flood Risk Assessments & Predictive Flood Maps

The main reliable flood extents information source for the Mill Road / Marsh Road Urban Design Framework Plan lands is the ECFRAMS and the ICPSS which investigated the main sources of flooding i.e. fluvial, tidal, pluvial and groundwater and produced detailed current and future flood extents and resultant flood zone maps. The ECFRAMS flood maps identify the main fluvial flood sources for the lands as the River Boyne and the Stameen River which are located to the north west of the subject site. The ECFRAMS and ICPSS flood maps identify tidal flood sources as the Boyne River (Estuary), Stameen River and the Irish Sea.

The ECFRAMS and ICPSS identifies the site as being within Flood Zone C i.e. outside of a future 1 in 1000 year, return period event. There is a strong correlation between the final ECFRAMS flood extents mapping and the ICPSS flood extent mapping. The ECFRAMS and ICPSS flood extents are included in **Appendices A and B** respectively.

It should be noted that minor watercourses were not modelled by the ECFRAMS. This includes the minor open ditches, and tributaries of same draining surrounding agricultural land.

A copy of the Strategic Flood Risk Assessment in support of the Meath County Development Plan is included in **Appendix C.**

3.5.2 Walkover Survey

The subject site predominantly comprises greenfield agricultural lands. The lands fall from a south west to north west and south west to north east. There is an existing ditch along the north-eastern boundary of the site, which continues in an easterly direction towards Mill Road and forms the northern boundary of Gaelscoil “An Bhradáin Feasa”. This ditch system connects to a ditch system in Mill Road and continues in an easterly direction towards the Stameen River.

There is an existing 1050mm diameter surface water sewer running parallel to the railway line to the north west of the site.

The coast is approximately 4km to the east.

3.5.3 Other Sources

Secondary information sources which identified flood risk included Ordnance Survey maps, historic maps, EPA mapping and Geological Survey Ireland maps. These identify the River Boyne and the Stameen River as the main watercourses for the area, with other minor ditch systems adjacent to the subject site.

3.6 Summary of Flood Risks Identified

The ECFRAMS and ICPSS indicates that the subject site is within Flood Zone C, with a low probability of flooding.

Final ECFRAMS fluvial and tidal flood extent mapping for the River Boyne and the Stameen River are included in **Appendix 'A'**. ICPSS flood extent mapping is included in **Appendix 'B'**.

4.0 FLOOD RISK MANAGEMENT

4.1 General

The subject site is within Flood Zone C. Flood Zone C lands are suitable for all types of land use, including residential development which is classified as vulnerable in the "Guidelines" (refer to Table 1 above). Therefore, the proposed residential development is suitable for this type of flood zoning, **the Planning Guidelines Sequential Approach is passed** (refer to Figure 5 above) and **it is not required to complete a site justification test.**

A detailed flood risk assessment follows, to consider **low pluvial flood risk** to the proposed development 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.

4.2 Surface Water Management Policy

Policies of the *Local Area Plan for the Southern Environs of Drogheda 2009-2015*, the *County Development Plan* and the *Mill Road / Marsh Road Urban Design Framework Plan 2017* relating to management of surface water runoff, are implemented for the subject site to include the following:

- *Sustainable Urban Drainage Systems*

  *For future development, Meath County Council requires that all developments incorporate '**Sustainable Drainage Systems' (SuDS)** as part of development proposals to reduce the rate and quantity of runoff.*

  The following SuDS features are proposed for the subject site:

  - Green Roofs are proposed for the apartment buildings;

- Permeable paving for the car park spaces of the development;
- Swales are proposed in the linear park and other open space areas;
- Bio retention areas are proposed for some small green spaces;
- Hydrobrake flow controls to limit surface water runoff to greenfield runoff;
- Surface water storage facilities for storm events up to a 1 in 100-year return period event;
- Petrol interceptors are proposed on the surface water outfalls, upstream of the hydrobrake flow controls;

- *All new developments are to provide **attenuation** to limit the outflow to that which occurs prior to development. Compliance with the recommendations contained in Technical Guidance Document, Volume 2, Chapter 4 of the Greater Dublin Strategic Drainage Study shall be required in all instances.*

- Surface water runoff from the subject site is limited to greenfield runoff Qbar, with surface water runoff exceeding the allowable outflow rate stored on site for up to a 1% AEP (Annual Exceedance Probability), or 1 in 100-year return period. It is proposed to separate the subject site into five surface water catchments for the management of surface water runoff from the site. Refer to the DBFL *"Infrastructure Design Report"* for details of the surface water management system for the development including details of the surface water catchments including attenuation rates and storage volumes for each catchment.

  Surface water runoff from the proposed development is managed in accordance with the recommendations of the GDSDS and the requirements of the Local Authority. This is achieved through a mix of traditional drainage (i.e. a standard gully and pipe-work collection system) and Sustainable Urban Drainage Systems (SuDS) where appropriate. Surface water attenuation and storage is also included in the design. The total surface water storage volume for the overall application site comprises circa 2,600m^3 for storm events up to 1%AEP.

  It is proposed to accommodate surface water storage for the development in a mixture of 'Stormtech' underground storage and overground detention basins for up to a 1% AEP (or 1 in 100-year return period storm). In accordance with the recommendations of the GDSDS, a minimum 500mm buffer is provided between the top water level in the surface water storage system in each surface water catchment (for a 1% AEP) and the lowest floor level in the relevant catchment.

In accordance with the recommendations of the GDSDS, the surface water drainage system for the development is designed to accommodate runoff from a 50%AEP (1 in 2-year return period) storm event and runoff from a 1%AEP (1 in 100-year return period) rainfall event under surcharged conditions.

4.3 Climate Change

The potential impact of climate change has been allowed for in the design of the surface water drainage network and storage system, with an allowance for a 10% increase in rainfall intensities, as recommended by the GDSDS.

4.4 Access and Egress During Flood Events

The proposed development (including essential infrastructure such as roads), is in flood zone 'C'. Where the capacity of the drainage system is exceeded for storm events exceeding a 1%AEP event, in general there would not be surface ponding of stormwater within the site as water would runoff towards open space areas, where controlled flooding would occur away from the residential development.

4.5 Residual Risks

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

1. Pluvial flooding from the drainage system related to a pipe blockage or from flood exceedance.
2. Pluvial flooding from the development's drainage system for storms exceeding the design capacity.

4.6 Flood Risk Mitigation

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

1.0 Pluvial flooding from the drainage system related to a pipe blockage or from flood exceedance:

- **Mitigating Measure M1:** The proposed drainage system to be maintained on a regular basis to reduce the risk of a blockage.

2.0 Pluvial flooding from the development's drainage system for storms exceeding the design capacity:

- **Mitigating Measure M2:** The drainage network is designed in accordance with the recommendations of the GDSDS and provides attenuated outlets and associated storage up to the 1% AEP (1 in 100-year return period event). The drainage network for the site has been designed to ensure that it can accommodate the 1 in 100-year rainfall event in surcharged conditions.

5.0 CONCLUSION

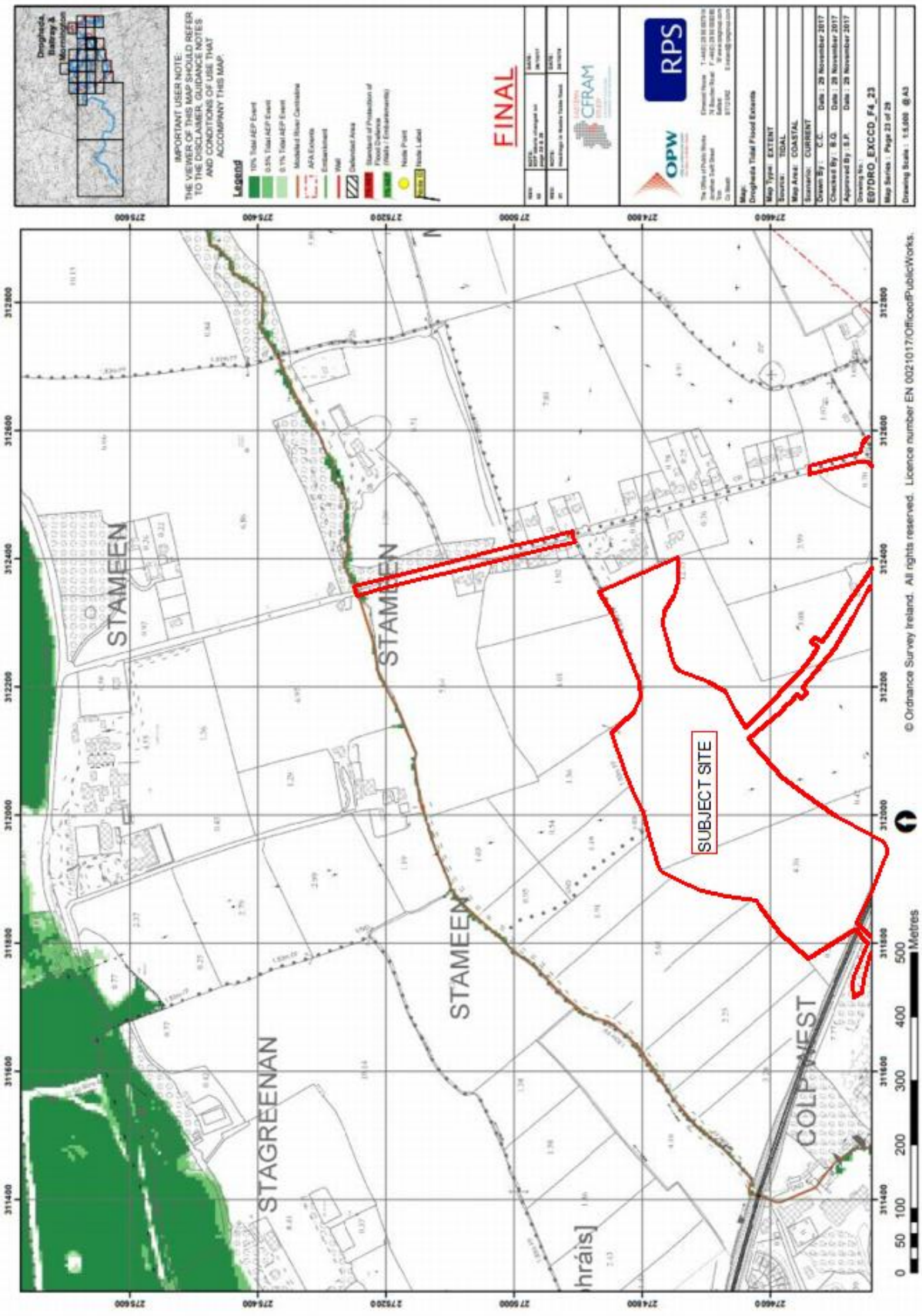
We consider that the proposed development, can be delivered on the site in the context of flood risk to same and that the implementation of mitigation measures, as outlined in this report, can be accommodated by the site's detailed design and the surface water drainage design.

The OPW document "The Planning System and Flood Risk Management Guidelines (November 2009)" requires that the proposed development be compatible with flood risk for the site. In accordance with these guidelines, the subject site is located within Flood Zone 'C'. Flood Zone C lands are suitable for all types of land use, including residential developments which are classified as "highly vulnerable" in the "Guidelines". Therefore, the proposed development is suitable for this type of flooding zoning and the Planning Guidelines Sequential Approach is passed (refer to *Figure 5*).

It is concluded that the development meets the requirements of The FRA Guidelines and that the proposed development is appropriate to this flood zonin and a justification test is not required.

APPENDIX A

Final ECFRAM Mapping


Drogheda, Bettry & Mornington
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Checked By : R.G. Date : 29 November 2017
Approved By : S.F. Date : 29 November 2017
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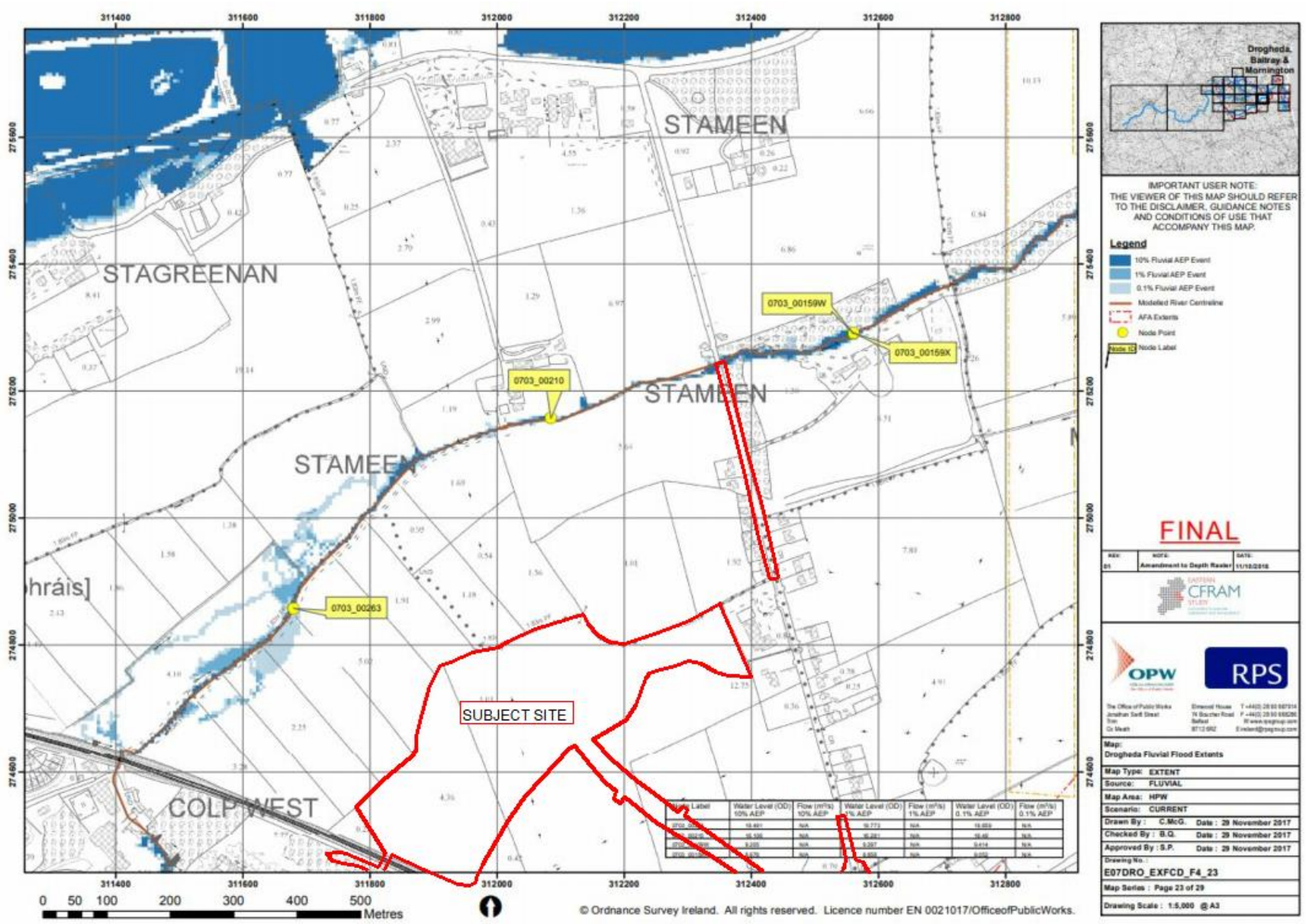
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Drogheda, Baltray & Mornington
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1% Fluvial AEP Event
0.1% Fluvial AEP Event
Modelled River Centreline
AFA Extents
Node Point
Node Label
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Amendment to Depth Raster
11/10/2016
CFRAM STUDY
OPW
RPS
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Map Area: HPW
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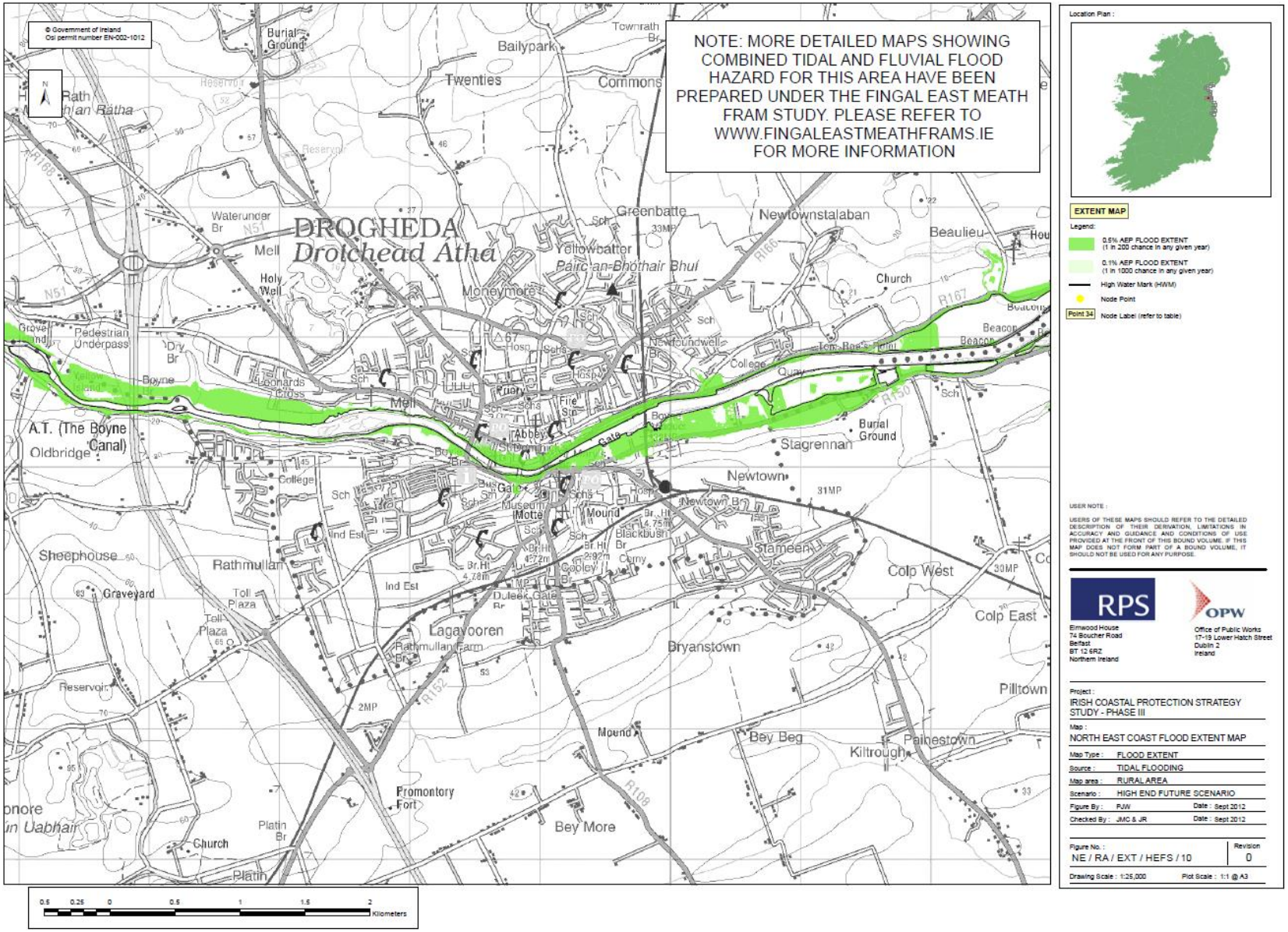
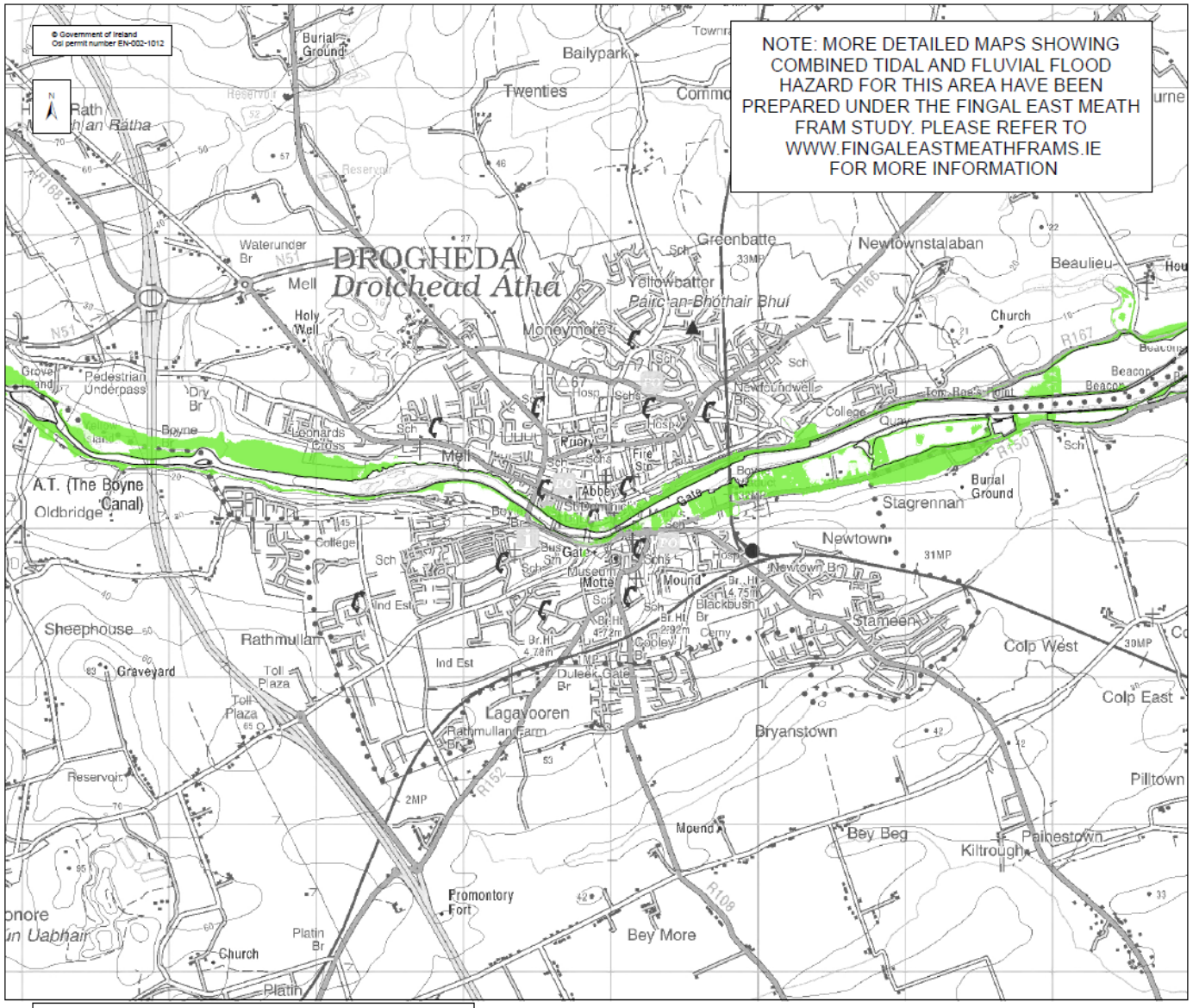
APPENDIX B

ICPSS Mapping


© Government of Ireland
Osi permit number EN-002-1012
NOTE: MORE DETAILED MAPS SHOWING COMBINED TIDAL AND FLUVIAL FLOOD HAZARD FOR THIS AREA HAVE BEEN PREPARED UNDER THE FINGAL EAST MEATH FRAM STUDY. PLEASE REFER TO WWW.FINGALEASTMEATHFRAMS.IE FOR MORE INFORMATION
DROGHEDA
Drolchead Atha
Location Plan :
EXTENT MAP
Legend:
0.5% AEP FLOOD EXTENT (1 in 200 chance in any given year)
0.1% AEP FLOOD EXTENT (1 in 1000 chance in any given year)
High Water Mark (HWM)
Node Point
Point 34
Node Label (refer to table)
USER NOTE :
USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF A BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.
RPS
Elmwood House
74 Boucher Road
Belfast
BT 12 6RZ
Northern Ireland
OPW
Office of Public Works
17-19 Lower Hatch Street
Dublin 2
Ireland
Project :
IRISH COASTAL PROTECTION STRATEGY STUDY - PHASE III
Map :
NORTH EAST COAST FLOOD EXTENT MAP
Map Type : FLOOD EXTENT
Source : TIDAL FLOODING
Map area : RURAL AREA
Scenario : HIGH END FUTURE SCENARIO
Figure By : RJW Date : Sept 2012
Checked By : JMC & JR Date : Sept 2012
Figure No. : NE / RA / EXT / HEFS / 10
Revision 0
Drawing Scale : 1:25,000 Plot Scale : 1:1 @ A3
0.5 0.25 0 0.5 1 1.5 2 Kilometers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Osi permit number EN-002-1012
NOTE: MORE DETAILED MAPS SHOWING COMBINED TIDAL AND FLUVIAL FLOOD HAZARD FOR THIS AREA HAVE BEEN PREPARED UNDER THE FINGAL EAST MEATH FRAM STUDY. PLEASE REFER TO WWW.FINGALEASTMEATHFRAMS.IE FOR MORE INFORMATION
DROGHEDA
Droichead Átha
Burial Ground
Bailypark
Twenties
Waterunder Br
Mell
Holy Well
Moneymore
Yellowbatter
Pairc an Bhothair Bhuí
Greenbatte
Newtownstalaban
Beaulieu
Church
Pedestrian Underpass
Dry Br
Boyne
Leonards Cross
Priory
Abbey
Gate
Newtownwell Br
College
Quay
Tom Rea's Point
Beacon
A.T. (The Boyne Canal)
Oldbridge
Stagrennan
Burial Ground
Newtown
31MP
Museum
Motte
Mound
Newtown Br
Blackbush
Stameen
Sheephouse
Rathmullan
Ind Est
Graveyard
Toll Plaza
Duleek Gate Br
Colp West
30MP
Colp East
Lagavooren
Rathmullan Farm Br
Bryanstown
Reservoir
2MP
Pilltown
Mound
Bey Beg
Painestown
Kiltrough
Promontory Fort
Bey More
Platin Br
Platin
Church
0.5 0.25 0 0.5 1 1.5 2
Kilometers
Location Plan :
EXTENT MAP
Legend:
0.5% AEP FLOOD EXTENT (1 in 200 chance in any given year)
0.1% AEP FLOOD EXTENT (1 in 1000 chance in any given year)
High Water Mark (HWM)
Node Point
Point 34 Node Label (refer to table)
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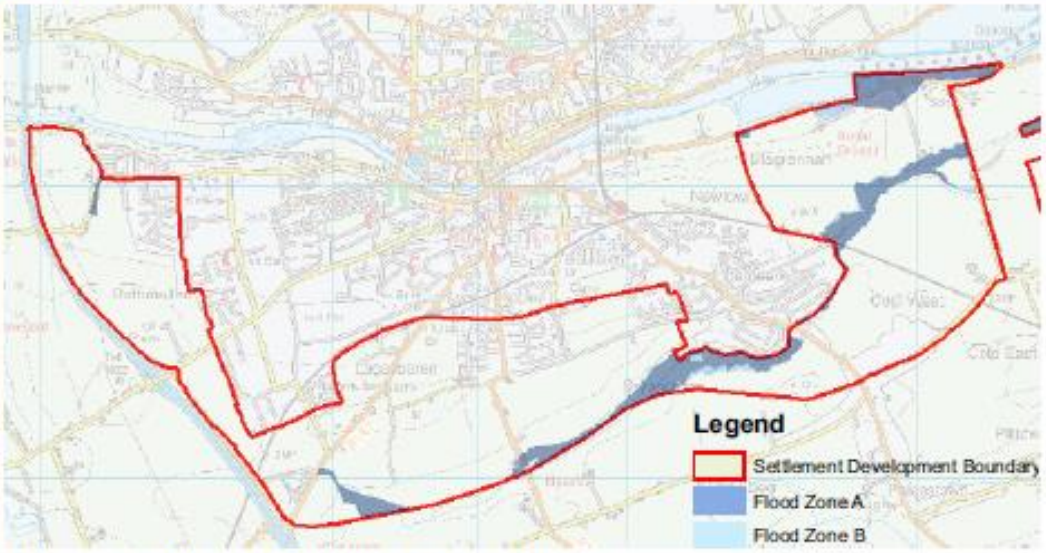
OPW
Office of Public Works
17-19 Lower Hatch Street
Dublin 2
Ireland
Project :
IRISH COASTAL PROTECTION STRATEGY STUDY - PHASE III
Map :
NORTH EAST COAST FLOOD EXTENT MAP
Map Type : FLOOD EXTENT
Source : TIDAL FLOODING
Map area : RURAL AREA
Scenario : MID RANGE FUTURE SCENARIO
Figure By : PJW Date : June 2012
Checked By : JMC & JR Date : June 2012
Figure No. : NE / RA / EXT / MRFS / 10
Revision 2
Drawing Scale : 1:25,000 Plot Scale : 1:1 @ A3

APPENDIX C

Extract of SFRA for Meath County Development Plan

A.11 Drogheda Southern Environs

Settlement Area	691.77 Ha
Zoning within Flood Zone A and/or B?	Yes
Area for Further Assessment under CFRAM programme?	No (but Drogheda, Co Louth is an Area for Further Assessment)



The Flood Zone mapping has been produced in accordance with the Planning Guidelines and therefore ignores the impact of flood protection structures. Areas protected by flood defences still carry a residual risk of flooding due to overtopping or breach, there may also be no guarantee of maintenance in perpetuity. Areas that benefit from defences are annotated separately. Note that Flood Zone mapping is only reproduced within the settlement development boundary. Flood Zone A – Fluvial: 1 in 100 year or 1% AEP, Tidal: 1 in 200 year or 0.5% AEP. Flood Zone B – 1 in 1000 year or 0.1% AEP.

Flood Zone mapping data source	PFRA & JFlow
Historical Flooding	R152 South of Drogheda Recurring Marsh Road, Drogheda Recurring Railway Bridge on R152, Drogheda Recurring Colp West Recurring
Comment	The flood zones will restrict the expansion of existing development to the south of the settlement area. Based on the settlement's location on the border with County Louth, an SFRA is recommended considering the wider Drogheda area. Further review is required following the publication of the Eastern CFRAM flood hazard mapping and subsequent management plans.
Conclusion	Joint SFRA with Drogheda Borough Council / Louth County Council required