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Site Specific Flood Risk Assessment

Proposed Road Improvement Scheme at Donacarney, Co. Meath

July 7th 2021

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1 Introduction

As part of the design process for a road improvement scheme along the R150 in Donacarney Co. Meath, ORS has been commission to carry out a Site-Specific Flood Risk Assessment for the proposed development. This report has been prepared to assess the flood risk to the site and adjacent lands as a result of the proposed development.

2 Risk Assessment Process

2.1 Introduction

The Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (DoEHLG) published 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' in 2009 (The Guidelines). The Guidelines introduce mechanisms for the incorporation of flood risk identification, assessment, and management into the planning process. This report has been prepared in accordance with these guidelines.

2.2 Definition of Flood Risk

Flood risk is an expression of the combination of the flood probability or likelihood and the magnitude of the potential consequences of the flood event. It is normally expressed in terms of the following relationship:

Flood Risk = Likelihood of Flooding x Consequences of Flooding

The likelihood of a flood event is dependent on the nature of the water body (Source) and the possible migratory routes from the water body (Pathways). The consequences of a flood event is dependent on the nature of people and assets impacted (Receptors). The Source – Pathway – Receptor linkage is illustrated in the Guidelines in the following graphic:

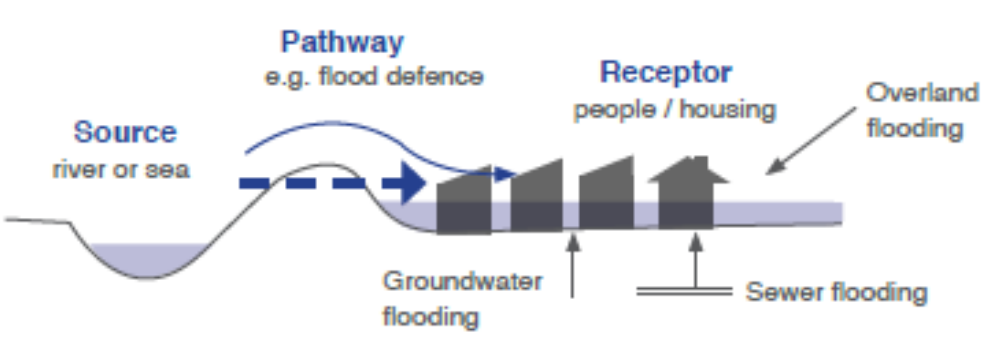


Figure 2.1 - Conceptual representation of Source - Pathway - Receptor model

The principal sources of flooding are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow, and river and coastal floodplains. The receptors can include people, their property, and the environment. All three elements as well as the vulnerability and exposure of receptors must be examined to determine the potential consequences.

The Guidelines recommend a staged approach to flood risk assessment that covers both the likelihood of flooding and the potential consequences. The stages of appraisal and assessment are;

1) Stage 1 Flood Risk Identification – to identify whether there may be any flooding or surface water management issues.
2) Stage 2 Initial Flood Risk Assessment – to confirm sources of flooding that may affect an area or proposed development, 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.
3) 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.

2.3 Likelihood of Flooding

The Guidelines define the likelihood of flooding as the probability or a frequency of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is generally expressed as the chance of a particular flood level being exceeded in any one year. This return period is described as the Annual Exceedance Probability (AEP). For example, a 1 in 100 or 1% flood is that which would, on average, be expected to occur once in 100 years, though it could happen at any time.

Annual Exceedance Probability (AEP) is the inverse of return period as shown in **Table 2.1** below.

Table 2.1: Return period and corresponding AEP

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

2.4 Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range. There are three types or levels of flood zones defined for the purposes of the Guidelines:

Flood Zone A – where the 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 – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 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 – where the 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.

It is important to note that when determining flood zones, the presence of flood protection structures should be ignored. This is because areas protected by flood defences still carry a residual risk from overtopping or breach of defences and the fact that there is no guarantee that the defences will be maintained in perpetuity.

2.5 Objectives and Principles of the Planning Guidelines

The principle actions when considering flood risk are set out in **Section 3.1** of the planning guidelines and are summarised below:

(1) *"Flood hazard and potential risk should be determined at the earliest stage of the planning process..."*
(2) *"Development should preferentially be located in areas with little or no flood hazard thereby avoiding or minimising the risk...."*
(3) *"Development should only be permitted in areas at risk of flooding when there are no alternative, reasonable sites available..."*
(4) *"Where development is necessary in areas at risk of flooding an appropriate land use should be selected"*
(5) *A precautionary approach should be applied, where necessary, to reflect uncertainties in flooding datasets and risk assessment techniques..."*
(6) *"Land required for current and future flood management... should be pro-actively identified..."*
(7) *"Flood risk to, and arising from, new development should be managed through location, layout and design incorporating Sustainable Drainage Systems (SuDS) and compensation for any loss of floodplain..."*
(8) *Strategic environmental assessment (SEA) of regional planning guidelines, development plans and local area plans should include flood risk as one of the key environmental criteria..."*

2.6 The Sequential Approach and Justification Test

The Sequential Approach has been adopted to ensure that developments are directed towards land that is at low risk of flooding, this is not always possible however, as many towns and city centres are located within flood plains.

The Sequential Approach is to be applied throughout the planning process is outlined in the Guidelines;

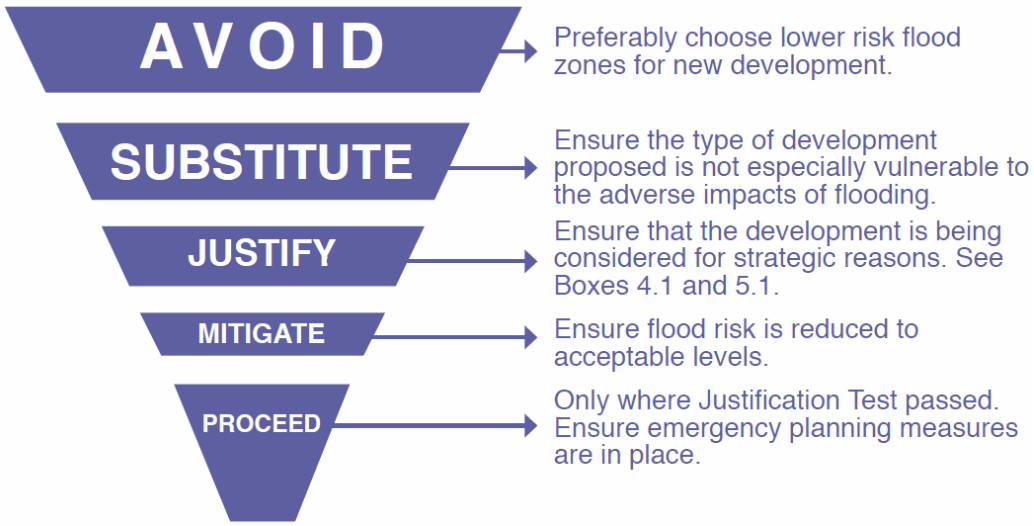


Figure 2.2 Sequential Approach (Source: The Planning System and Flood Risk Management)

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. The test comprises the following two processes.

(1) The first is the Plan-making Justification Test and is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding.
(2) The second is the Development Management Justification Test and is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

The types of development that would be required to meet the Justification Test are illustrated in the table below.

Table 2.2 Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test (Source: The Planning System and Flood Risk Management)

	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

3 Project Scope

This report outlines the Site-Specific Flood Risk Assessment for the planning application associated with a road improvement scheme R150 regional road in Donacarney Co. Meath. The extent of the works associated with this scheme are detailed in **Appendix F – Site Drawings** and will consist of the following:

- Widening of the R150 regional road between Donacarney School to Whitefield Manor in Bettystown.
- Provision of a single lane footpath and cycleway on the north-eastern section of the road.
- Water crossing of the Bethaghstown Stream midway through the development.
- Removal of existing hedgerows.
- Provision of a single farm cattle underpass towards the south of the development.
- Installation of drainage works.

The extent of the road improvement works along with the approximate position of the proposed cattle underpass are illustrated in **Figure 3.1** below.

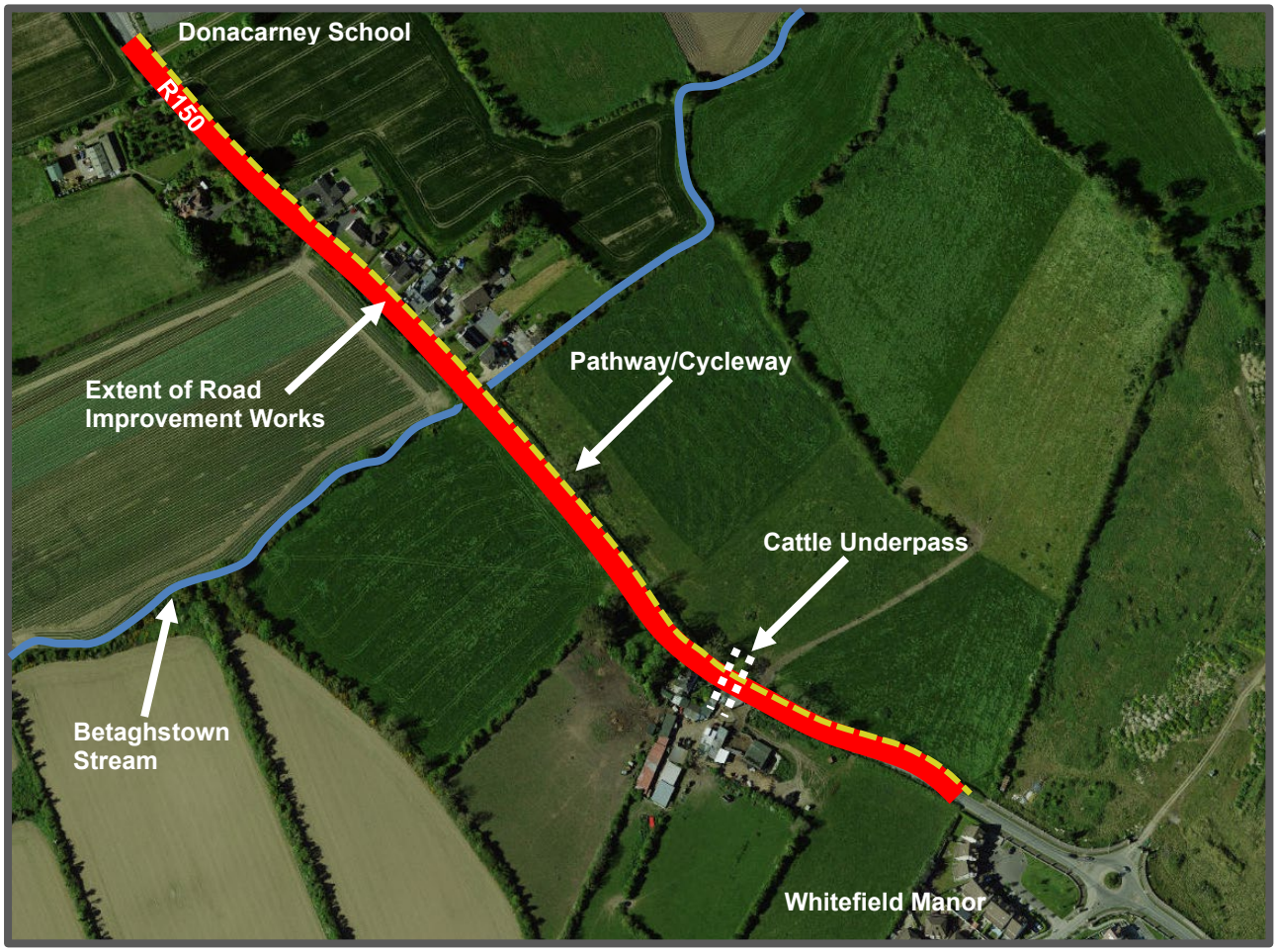


Figure 3.1 – Site location (Source: ArcGIS)

4 Flood Risk Identification

4.1 General

This Flood Risk Identification report includes a review of the existing information and the identification of any flooding or surface water management issues in the vicinity of the proposed site that may warrant further investigation.

The site is located within in the Nanny-Delvin surface water catchment within Hydrometric Area 08 of the Eastern River Basin District (ERBD). The Nanny-Delvin Catchment is one of the smallest catchments of the ERBD with a total catchment area of 711 km^2.

The principal hydrological feature closest to the site is the Nanny River which flows east from Kentstown, after which it is joined from the south by the River Hurley, which drains the area north of Ashbourne. The Nanny continues east through Duleek before flowing into the Irish Sea at Laytown. A tributary of the Nanny is located *ca.* 2.4km southwest of the proposed development.

The nearest hydrological feature to the proposed development is the Betaghstown Stream, a tributary of which, running east-west transects the R150 at roughly the midway point of the proposed road improvement scheme. The Betaghstown waterbody consists of a network of several steams which tie in with several drainage district channels located towards the north of Bettystown. These Drainage Districts were established by the Commissioners of Public Works under a number of drainage and navigation acts from 1842 to the 1930s to improve land for agriculture and to mitigate flooding. Channels and lakes were deepened and widened, weirs removed, embankments constructed, bridges replaced or modified, and various other work was carried out.

4.2 Data Sources

The following were consulted in the preparation of this report;

Table 4.1 Information Sources Consulted

Source	Comment
OPW Preliminary Flood Risk Assessment (PFRA) maps consulted	Fluvial, Pluvial, Coastal and Groundwater flooding examined.
OPW Flood records	Review historic flood incidents in the area.
Floodinfo.ie online mapping	Fluvial, Pluvial, Coastal and Groundwater flooding, Arterial Drainage and OPW flood records examined.
EPA/GIS online mapping	Identification location of and flow directions in rivers and streams. GSI Teagasc subsoils map consulted to identify alluvial deposits on site that may indicate the presence of a watercourse and floodplain.
Historical Maps	OSI Geo Hive 6'' Cassini and 25" maps reviewed to look for areas of historic flooding.

Fingal East Meath Flood Risk Assessment and Management Study	Review flood risk assessment and modelled flood levels for Donacarney area.
Strategic Flood Risk Assessment for County Meath 2013 - 2019	
Flood Risk Assessment and Management Plan for the Meath CDP 2020 - 2026	
Draft Meath County Development Plan 2020 - 2026	To Review Objectives and Policies in relation to Flood Risk Management and strategic infrastructure development.
Eastern CFRAM Study HA07 Hydraulics Report 2016	Identification and review of CFRAM flood mapping and modelled flood levels for the Betaghstown Stream.
Site Drawings	Review site levels relative to estimated flood levels.

4.3 Previous Flood Risk Assessment and Predictive Flood Maps

4.3.1 Preliminary Risk Assessment

The Preliminary Flood Risk Assessment (PFRA) involved a national screening exercise, based on available and readily derivable information, to identify areas where there may be a significant risk associated with flooding (referred to as Areas for Further Assessment, or AFA's). As part of the PFRA study, maps of the country were produced showing the indicative fluvial, pluvial, coastal and groundwater flood extents.

The PFRA map at the proposed development site does not indicate that the site is at risk of fluvial or coastal flooding.

The published PFRA fluvial flood map has been included in **Appendix A** of this report.

4.3.2 Catchment Flood Risk Assessment and Management Study - Floodinfo.ie

The CFRAM programme led by the OPW, provides a detailed assessment of flooding in areas identified as Area for Further Assessment (AFA's) during the PFRA study. Catchment wide Flood Risk Management Plans were also developed as part of the programme. Under the National CFRAM programme, the detailed modelling and assessment stage of each study will include for climate change effects.

The southern portion of the site is located within an AFA under the CFRAM programme and so 0.1%,1% and 10% AEP Fluvial, and 0.1%, 0.5% and 10% Coastal flood events have been modelled.

The modelled flood maps indicate that the site is located within Flood Zone C, hence is considered to be at a low risk of flooding.

The published Fluvial and Coastal CFRAM maps has been included in **Appendix B** of this report.

4.3.3 OPW Drainage Maps – Floodinfo.ie

Arterial Drainage Scheme (ADS) and Drainage District (DD) maps of the area show that the proposed site is **not** located in benefitting lands.

A large swathe of land to the east of the site are located within Benefitted Lands. The Drainage District maps indicate several channels of the Betaghstown (known locally as the Mornington Stream) Stream Network were deepened and widened under works carried out by the Commissioners of Public Works under a number of drainage and navigation acts from 1842 to the 1930s to improve land for agriculture and to mitigate flooding.

Local authorities are charged with a responsibility to this day, to maintain Drainage Districts. The Arterial Drainage Act, 1945 contains a number of provisions for the management of Drainage Districts in Part III and Part VIII of the act.

The published Arterial Drainage Scheme (ADS) and Drainage District (DD) maps has been included in **Appendix C** of this report.

4.3.4 Fingal East Meath Flood Risk Assessment and Management Study

In 2008, Fingal County Council (FCC), the Office of Public Works (OPW) and Meath County Council (MCC) appointed Halcrow Barry to carry out the Fingal East Meath Flood Risk Assessment and Management Study (FEM FRAMS)[1]. The final report for this exercise was published in July 2014.

The main stated objectives for FEM FRAMS were as follows:

- assess flood risk, through the identification of flood hazard areas and the associated impacts of flooding.
- build the strategic information base necessary for making informed decisions in relation to managing flood risk and provide appropriate data to inform future spatial planning and development.
- identify viable structural and non-structural measures and options for managing the flood risks for localised high-risk areas and within the study area as a whole.
- prepare a strategic flood risk management plan for the Fingal East Meath area, namely, the Fingal East Meath Flood Risk Management Plan (FEM FRMP) and associated Strategic Environmental Assessment (SEA) that sets out the measures and policies that should be pursued by the Local Authorities and the OPW to achieve the most cost-effective and sustainable management of flood risk within the Fingal and East Meath study area.

This study concluded that the majority of the flood risk to properties is along the Fingal and Meath coastline and estuaries where areas are at risk from both fluvial and coastal flooding.

[1] Halcrow Barry, Fingal County Council, Meath County Council & Office of Public Works, (2018) *Fingal East Meath Flood Risk Assessment & Management Study – Final Report.*

Fluvial flood risk management options were recommended for the Nanny/Delvin assessment areas and coastal flood risk management options were recommended for the Brookside Stream which both lie adjacent to the proposed site. However, the FEM FRAMS study did not suggest any site-specific flood risk management options for the proposed site area at Donacarney. The results of the assessment demonstrated that there were some general flood risk management measures that could be applied throughout the study area, resulting in the following recommendations to be carried out by the relevant authorities:

1. Proactive maintenance – involving the monitoring of culverts throughout the region and scheduling the removal of debris on a regular basis.
2. Targeted public awareness and preparedness campaign to educate the public of the risk of flooding to their properties and the protection methods available to them to reduce potential damage from flood events.

4.3.5 Meath County Development Plan 2013 - 2019

The purpose of the County Development Plan (CDP) is to set out an overall strategy for the proper planning and sustainable development for the County. The preparation of the Plan requires consideration of the long-term goals and aspirations of Meath.

A Strategic Flood Risk Assessment (SFRA) is carried out as part of the preparation of the CDP and this helps to inform the Land Zoning Objectives Maps which are included in the final CDP.

During the SFRA a series of Flood Zone Maps were produced for towns throughout Meath. These Flood Zone Maps were produced in accordance with the Planning Guidelines and therefore they ignore the impact of flood protection structures.

The proposed site location fell between two separate Flood Zone Maps within the SFRA carried out in 2011, "*Map A.4 Bettystown*" and "*Map A.9 Donacarney*". The following observations were made in relation to the site area:

- No fluvial flood risk identified. Some potential for isolated areas of surface water ponding, recurring flooding reported on R150 near Donacarney school.
- Although significant flood risks were identified within the Bettystown Flood Zone Map, no flood risk was identified near the R150.

The published CDP Land Zoning Maps did not provide any detail on the area of the proposed site.

The relevant published SFRA Flood Zone Maps have been included in **Appendix D** of this report.

4.3.6 Draft Meath County Development Plan 2021 – 2027

Written statements of the draft County Development Plan (CDP) (2021 – 2027) provide an update on the overall strategy for the proper planning and sustainable development for County Meath.

According to the CDP Land Zoning Objective Maps, the proposed development is located with a RA - "Rural Area" in which the zoning objective is stated as follows:

"*To protect and promote in a balanced way, the development of agriculture, forestry and rural-related enterprise, biodiversity, the rural landscape, and the built and cultural heritage*."

The Council have outlined several policies and objectives which are to be adopted in an effort to realise the development strategy vision. Those with relevance to the flood risk assessment for the proposed road improvement development are outlined as follows:

RUR POL 1: *"To support the continued vitality and viability of rural areas by promoting sustainable social and economic development."*

RUR POL 2: *"To manage residential development in Strong Rural Areas by ensuring that in these areas the provision of single houses in the open countryside facilitates farm families and those with demonstrable intrinsic links to the rural area to continue to live and/ or work within their own communities.".*

RUR POL 17: *"To maintain a vibrant and healthy agricultural sector based on the principles of sustainable development whilst at the same time finding alternative employment in or close to rural areas to sustain rural communities."*

RUR POL 31: *"To protect agricultural or agri-business uses from unplanned and/or incompatible urban development."*

RD POL 59: *"To ensure that all development accessing off the county's road network is at a location and carried out in a manner which would not endanger public safety by way of a traffic hazard"*

The published CDP Land Zoning Maps have been included in **Appendix E** of this report

4.3.7 Flood Risk Assessment and Management Plan for the Meath CDP 2021 - 2027

A Strategic Flood Risk Assessment (SFRA) has been carried out as part of the preparation of the Meath County Development Plan 2021-2027. This document, titled "*Flood Risk Assessment and Management Plan for the Meath CDP 2021 – 2027*" provides an update on the SFRA completed for the County in 2011.

This report produced a series of updated Flood Zone Maps for towns throughout Meath. These Flood Zone Maps were produced in accordance with the Planning Guidelines and therefore they ignore 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. The annual exceedance probabilities per flood zones are outlined as followed:

- 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

The proposed site location was included on a Flood Zone Map titled "*5.7 Bettystown/Laytown/Mornington East /Donacarney/ Mornington*" The following observations were made in relation to the site area:

- A narrow swathe of land flanking the Betaghstown Stream which passes under the R150 roughly midway between the proposed road improvement works has been designated within Flood Zone A.
- A Justification Test applies for all lands in Zone A/B and it is not generally appropriate to construct large amounts of new housing in defended areas.
- Any future planning applications for the spine road and associated crossings of the Brookside Stream *ca*. 1.25km S of the proposed site must be subject to an appropriately detailed FRA at development management stage to demonstrate that the application fully adheres to the Planning System and Flood Risk Management Guidelines, including the Justification Test.
- There is a significant potential impact from climate change (sea level rise) as a result of the location. The flood relief scheme should have been developed to be adaptable to these impacts.

The published Strategic Flood Risk Assessment Map for Bettystown/Laytown/Mornington East /Donacarney/ Mornington has been included in **Appendix F** of this report.

4.3.8 OPW Records

The OPW Flood Record summarises all flood events documented within 2.5km of the subject site. A recurring flood event is noted *ca*. 150m north of the proposed site at Donacarney School where it floods every year after heavy rain due to inadequate drainage on the road.

There are no recorded flood events within the proposed site boundary.

Refer to **Appendix G** for OPW Flood Record and general plan of areas impacted.

4.3.9 Site Survey & Drawings

The proposed finished road level is 14.06m AOD at the most northerly extent of the development and declines to 11.64m AOD at the proposed crossing at Betaghstown Stream. The road profile then inclines to 13.15m AOD at the proposed location of the cattle crossing and declines once more to 12.46m AOD at the most southern extent of the development.

The civil engineering design which accompanies this planning application details the drainage system design for appropriate management of surface water run-off and mitigation of pluvial flood risk. The total area of land affected by the proposed development is 800m^2. It is proposed to step-back the existing open drain to the north-east of the road by approximately 1m from it's current position. The new drainage channel will be 1.72m in width and will be of adequate depth to provide sufficient capacity for the projected increase of incident run-off as a consequence of the greater surface area of impermeable surface.

The downstream flood risk, which includes the residential receptors which flank the Betaghstown Stream will be managed by the installation of an underground attenuation tank. Following completion of the road improvement scheme, the total impermeable surface area of the road and the footpath will be as follows:

- Footpath: 1,894.22m^2
- Road (carriageway adjacent to the path): 1,877.39m^2

Furthermore, the existing culvert located at the road crossing of the Bethaghstown Stream will be extended to accommodate the new footpath/cycleway.

Underground attenuation with a capacity of 168.5m^3 will be installed as part of the road improvement scheme. This is to cater for the run-off volumes anticipated (162m^3) and lost flood plain storage (6.5m^3) as a result of the proposed development under a 1:100-year storm event. This will sufficiently manage the flood risk to downstream flood receptors including the residential units located within flood zone A at the Bethaghstown Stream. Attenuation Calculations are included in **Appendix K**.

The site drawings are included in **Appendix H** of this report.

4.3.10 GSI Maps

Geological Survey of Ireland online mapping indicates that the soils underlying the subject site are surface water gleys and groundwater gleys derived from sandstone and shale till with gleys derived from glaciofluvial sands and gravels towards the south of the proposed site. The underlying bedrock is described as dark limestone and calcareous shale which forms part of the Mornington Formation.

Refer to **Appendix I** for GSI soils and bedrock maps.

4.3.11 Historic Maps

Historical maps are consulted to indicate areas of flooding documented previously to records being kept by the current responsible authorities. The enclosed historical map has been prepared using GeoHive, web-based access to authoritative Irish spatial data from multiple providers, including Ordnance Survey Ireland. No areas of flooding were indicated on the 6” Cassini or 25” maps.

There are no historic flooding issues recorded on the historic maps of the site.

Refer to **Appendix J** for Historical Maps.

5 Justification Test

5.1 Background

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. The Strategic Flood Risk Assessment (SFRA) which was carried out as part of the preparation of the Meath County Development Plan 2020-2026 has recommended that a Justification Test is carried out for any development proposed for lands in Flood Risk Zone A or B. As the proposed road improvement works are scheduled to cross the Betaghstown Stream, an area which has been declared as Flood Zone A in the "*Flood Risk Assessment and Management Plan for the Meath CDP 2020 – 2026"*, the Justification test must be applied to the proposed development.

5.2 Justification Test

Table 5.1 summarises the Flooding and Development Management Justification Test which has been applied to the proposed road improvement development of the R150, linking Donacarney School to Bettystown.

Table 5.1. Flooding and Development Management Justification Test

Justification Test Criteria	Information
(a) 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	The proposed site area has zoned RA – Rural Area within the Meath CDP 2021-2027. The mandate for this zoning objective is: "*To protect and promote in a balanced way, the development of agriculture, forestry and rural-related enterprise, biodiversity, the rural landscape, and the built and cultural heritage*" The CDP outlines the following Rural Policy Objectives in which the proposed Road Improvement Scheme is crucial in satisfying these objectives.
RUR POL 1: "To support the continued vitality and viability of rural areas by promoting sustainable social and economic development."	The principle objective behind the proposed road improvement scheme is to provide a tenable link for all road users between Donacarney School and Bettystown Community Centre ca. 1km South which are currently linked by the R150 Regional Road. The proposed road improvement scheme will support the vitality and viability of the area by improving access to the Donacarney School for all road users.
RUR POL 2: "To manage residential development in Strong Rural Areas by ensuring that in these areas the provision of single houses in the open countryside facilitates farm families and those with demonstrable intrinsic links to the rural area to continue to live and/ or work within their own communities.".	The R150 currently consists of a single carriageway on each side for traffic and has no safe accessibility for other road users such as pedestrians or cyclists due to the absence of footpaths, cycleways or hard shoulder lanes. The provision of a footpath and cycleway along the proposed road improvement scheme will provide an intrinsic link between Bettystown and Donacarney School and will improve access to both areas for the several residential units which lie along the R150.
RUR POL 17: "To maintain a vibrant and healthy agricultural sector based on the principles of sustainable development whilst at the same time finding alternative employment in or close to	The Provision of a single farm cattle underpass is has been included in the project design replace the need for local farmers to move cattle across the roadway and to improve the safety of all road users in the process.

rural areas to sustain rural communities."	
RUR POL 31: "To protect agricultural or agri-business uses from unplanned and/or incompatible urban development."	
RD POL 59: "To ensure that all development accessing off the county's road network is at a location and carried out in a manner which would not endanger public safety by way of a traffic hazard"	There are several residential units along the R150 in which access for vulnerable road users such as pedestrians or cyclists is currently prohibited due to the lack of appropriate infrastructure. The provision of a footpath and cycleway along the proposed road improvement scheme will improve access to these dwellings for all road users. The civil engineering design which accompanies this planning application details the drainage system design for appropriate management of surface water run-off and mitigation of pluvial flood risk. The flood risk to the dwellings identified adjacent to flood zone A at the Betaghstown Stream will be managed by the installation of a 168.5m^3 underground attenuation tank which will be of sufficient capacity to attenuate the extra run-off anticipated and lost flood plain storage as a result of the proposed development.
(b) 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;	The development proposals include for a sustainable approach in surface water management, including the use of various SuDS features detailed in the development's Infrastructure Design Report reducing the peak flow rate of surface water to calculated Greenfield Run-off Rates. The proposed drainage design for the development will provide for controlled discharge of surfacewater runoff and storage of the flood water potentially displaced by this development, thereby mitigating potential increases in flood risk elsewhere.
ii. The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;	According to Table 3.1 of the DoEHLG Guidelines the proposed road development can be classed as 'Local transport infrastructure' and can generally be classed as a 'Less Vulnerable Development'. However, due to the proximity of residential development to the flood zone this development is to be considered a highly vulnerable development for the purposes of this Justification Test. The proposed road improvement works are set to cross an area at the Betaghstown Stream of <30m^2 which is currently designated as 'Flood Zone A'. The new road development includes provision for drainage design which will be considered an improvement on the drainage infrastructure which is currently in place. The drainage system will consist of an open drain and underground attenuation capacity of 168.5m^3. This is considered sufficient storage for lost floodplain storage capacity and critical surface water events which historically would have discharged straight into the Betaghstown stream. **(Appendix K Refers)**.
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	The majority of the road improvement scheme is located in Flood Zone C which is suitable for the proposed development. The finished road level of the proposed stretch of road which is set to pass through the 30m^2 area of 'Flood Zone A' will include the installation of a drainage system design for appropriate management of surface water run-off and mitigation of pluvial flood risk and lost flood plain storage. Details of which are included in the Civil Engineering Report which accompanies this planning application.

and provisions for emergency services access	The drainage system will consist of an open drain and underground attenuation capacity of 168.5m^3. This is considered sufficient storage for lost floodplain storage capacity and critical surface water events which historically would have discharged straight into the Betaghstown stream **(Appendix K Refers)**.
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	The proposed development is designed in accordance with the planning objectives and also in accordance with the Planning System and Flood Risk Management Guidelines.

5.3 Justification Test Verdict

The proposed development has been deemed to have passed the justification test on the basis that the proposed development complies with the land zoning objectives of the site location; that appropriate measures have been taken to mitigate the flood risk to the development site itself through the provision of an open land drain and underground attenuation; and the development will not increase flood risk elsewhere due to the provision of the additional capacity in the proposed drainage channel and the 162m^3 underground attenuation capacity. The proposed drainage works are appropriately scaled to manage a 1-in-100 flood risk and the extra anticipated run-off from the resultant land use changes posed by the proposed development

6 Conclusions

In reviewing existing information in relation to the flood risk posed to the proposed development site the following sources were consulted:

- OPW Preliminary Flood Risk Assessment (PFRA) maps consulted.
- OPW Flood records.
- Floodinfo.ie online mapping.
- EPA online mapping.
- Historical Maps.
- Fingal East Meath Flood Risk Assessment and Management Study.
- Strategic Flood Risk Assessment for County Meath 2013 – 2019.
- Flood Risk Assessment and Management Plan for the Meath CDP 2020 - 2026
- Draft Meath County Development Plan 2020 - 2026
- Eastern CFRAM Study HA07 Hydraulics Report 2016
- Site Drawings

There have been no recorded historic flooding incidents at this site.

CFRAM maps prepared using detailed quantitative flood modelling of the area indicate that the southern section of the site is located in Flood Zone C. The extent of the Area of Further Assessment (AFA) did not cover the northern section of the R150 hence projected flood levels were not modelled for this section of the proposed development under the CFRAM program.

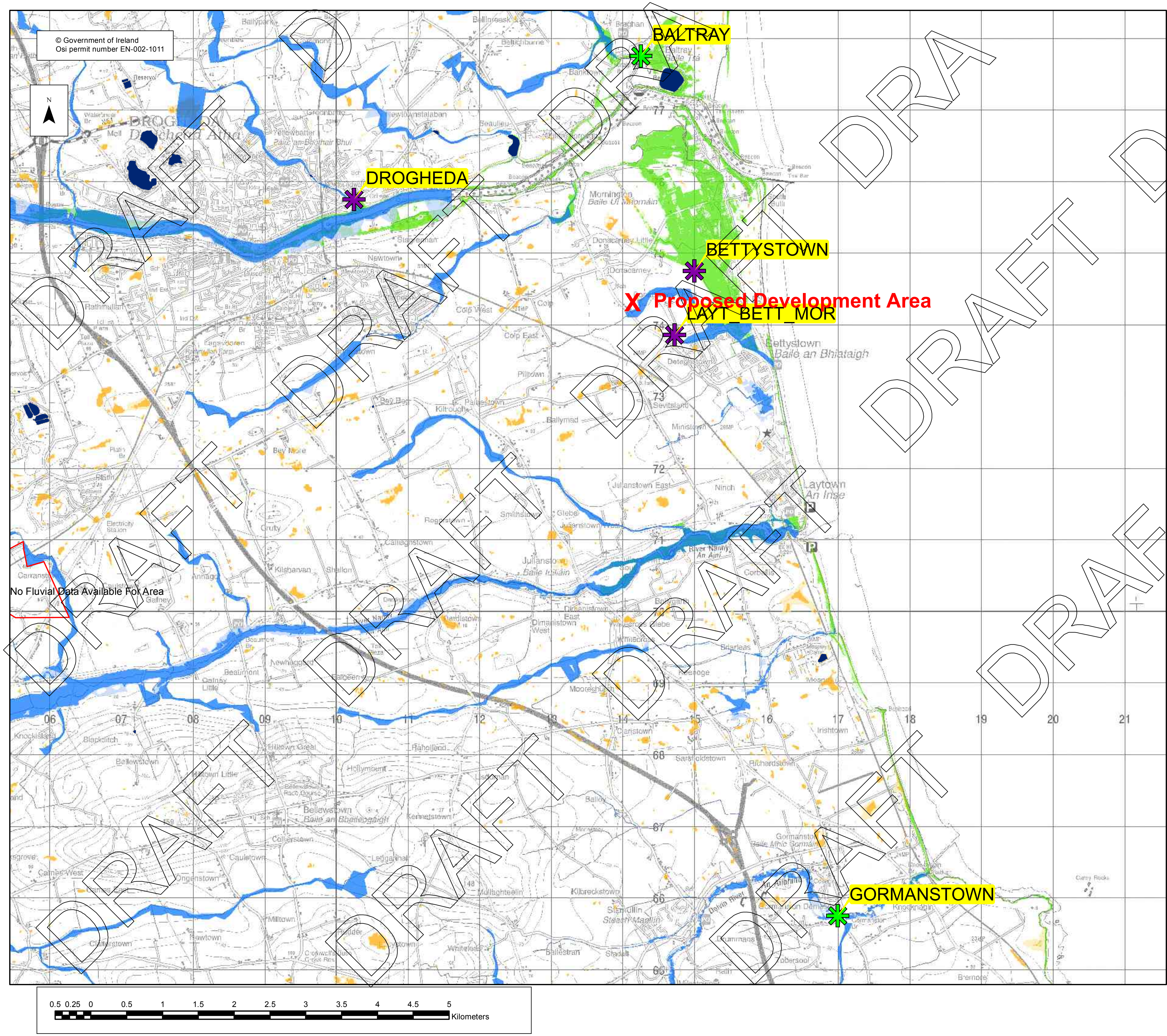
The Strategic Flood Risk Assessment Report for the 2021 – 2027 County Development Plan for Meath has designated a small area which the proposed road improvement works crosses the Betaghstown Stream, as Flood Zone A.

The proposed finished road level at the crossing of the Betaghstown Stream is 11.64m AOD. Flood extents for the section of the Betaghstown Stream in which the proposed road development crosses were not modelled. Estimation of the freeboard between finished road levels and potential flood levels is not possible due to the absence of this data. The drainage system detailed in the Civil Engineering Report which accompanies this planning report consists of an underground attenuation capacity of 168.5m3. This is considered sufficient storage for lost floodplain storage capacity and critical surface water events which historically would have discharged straight into the Betaghstown stream.

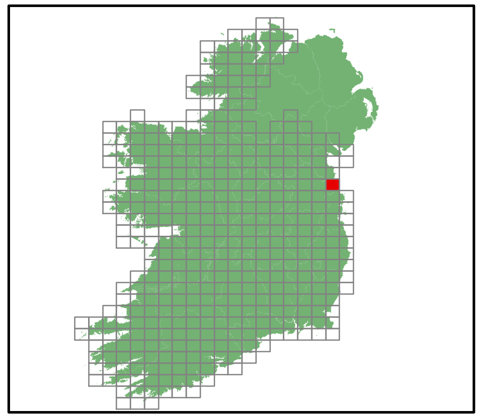
Based on the information available, detailed above, the majority of the proposed development is located in Flood Risk Zone C and the associated risk flood risk to the proposed development and elsewhere is considered to be low in these areas.

Approximately 30m^2 of the proposed development is located in Flood Risk Zone A and the associated flood risk to the proposed development and elsewhere is mitigated by the installation of a drainage system design scaled for appropriate and mitigation of pluvial and fluvial flood risk posed by the development in this area.

Appendix A – PFRA Maps



Location Plan :



Legend:

Flood Extents

Fluvial - Indicative 1% AEP (100-yr) Event

Fluvial - Extreme Event

Coastal - Indicative 0.5% AEP (200-yr) Event

Coastal - Extreme Event

Pluvial - Indicative 1% AEP (100-yr) Event

Pluvial - Extreme Event

Groundwater Flood Extents

Lakes / Turloughs

PFRA Outcomes

Probable Area for Further Assesment

Possible Area for Further Assesment

Important User Note:

The flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location. Information on the purpose, development and limitations of these maps is available in the relevant reports (see www.cfram.ie). Users should seek professional advice if they intend to rely on the maps in any way.

If you believe that the maps are inaccurate in some way please forward full details by contacting the OPW (refer to PFRA Information leaflets or 'Have Your Say' on www.cfram.ie).

Office of Public Works
Jonathon Swift Street
Trim
Co Meath
Ireland

Project :
PRELIMINARY FLOOD RISK ASSESMENT (PFRA)

Map :
PFRA Indicative extents and outcomes
- Draft for Consultation

Figure By : PJW	Date : July2011
Checked By : MA	Date : July 2011
Figure No. : 2019 / MAP / 291 / A	Revision 0
Drawing Scale : 1:50,000	Plot Scale : 1:1 @ A3

Appendix B – CFRAM Map

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OSi permit number EN-002-1006

X Proposed Area for Development

N

006

007

21Mab384

21Mab573

21Mab168

21Ma4

21Ma190

21Ma857

21Ma591

21Ma327U

21Ma1358

21Ma1064

21Ma1799

21Ma1877D

21Ma1717

21Ma2194

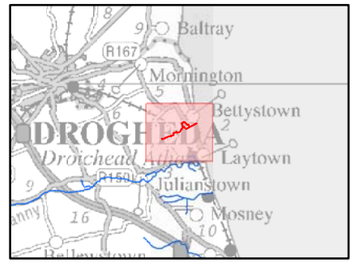
21Ma2000

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

Node Label	10% AEP Event		0.5% AEP Event		0.1% AEP Event	
	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)
21Ma2194	17.76	0.40	17.76	0.40	17.86	0.56
21Ma2000	17.72		17.72		17.80	
21Ma1877D	16.95		16.96		16.99	
21Ma1799	16.94		16.94		16.97	
21Ma1717	16.20		16.23		16.32	
21Ma1358	15.49		15.54		15.62	
21Ma1064	13.48	0.56	13.53	0.69	13.61	1.03
21Ma857	11.61		11.65		11.74	
21Ma591	7.72		7.76		7.82	
21Ma327U	5.14	0.24	5.98	0.30	6.53	0.46
21Ma190	5.07		5.97		6.52	
21Ma4	3.20	0.69	3.51	0.91	3.73	1.01
21Mab573	7.78		7.81		7.86	
21Mab384	6.78		6.88		7.03	
21Mab168	6.60		6.65		6.71	
006	3.09		3.51		3.75	
007	3.08		3.52		3.75	

0.2 0.1 0 0.2 Kilometres

Location Plan :



EXTENT MAP

Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 0.5 % AEP Flood Extent (1 in 200 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (> 40m) (10% and 0.1% AEP)
- High Confidence (<20m) (0.5% AEP)
- Medium Confidence (<40m) (0.5% AEP)
- Low Confidence (>40m) (0.5% AEP)
- Modelled River Centreline
- Node Point
- 21Ma237 Node label with level data (refer to table)
- 21Ma237 Node level with flow & level data (refer to table)

High confidence
Medium confidence
Low confidence
refer to table

USER NOTE :

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.

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Tel: +353-1-4975716

Clients :

Fingal County Council
Meath County Council
OPW

Project :
FEM FRAMS

Map :
BROOK SIDE STREAM MODEL FLOOD

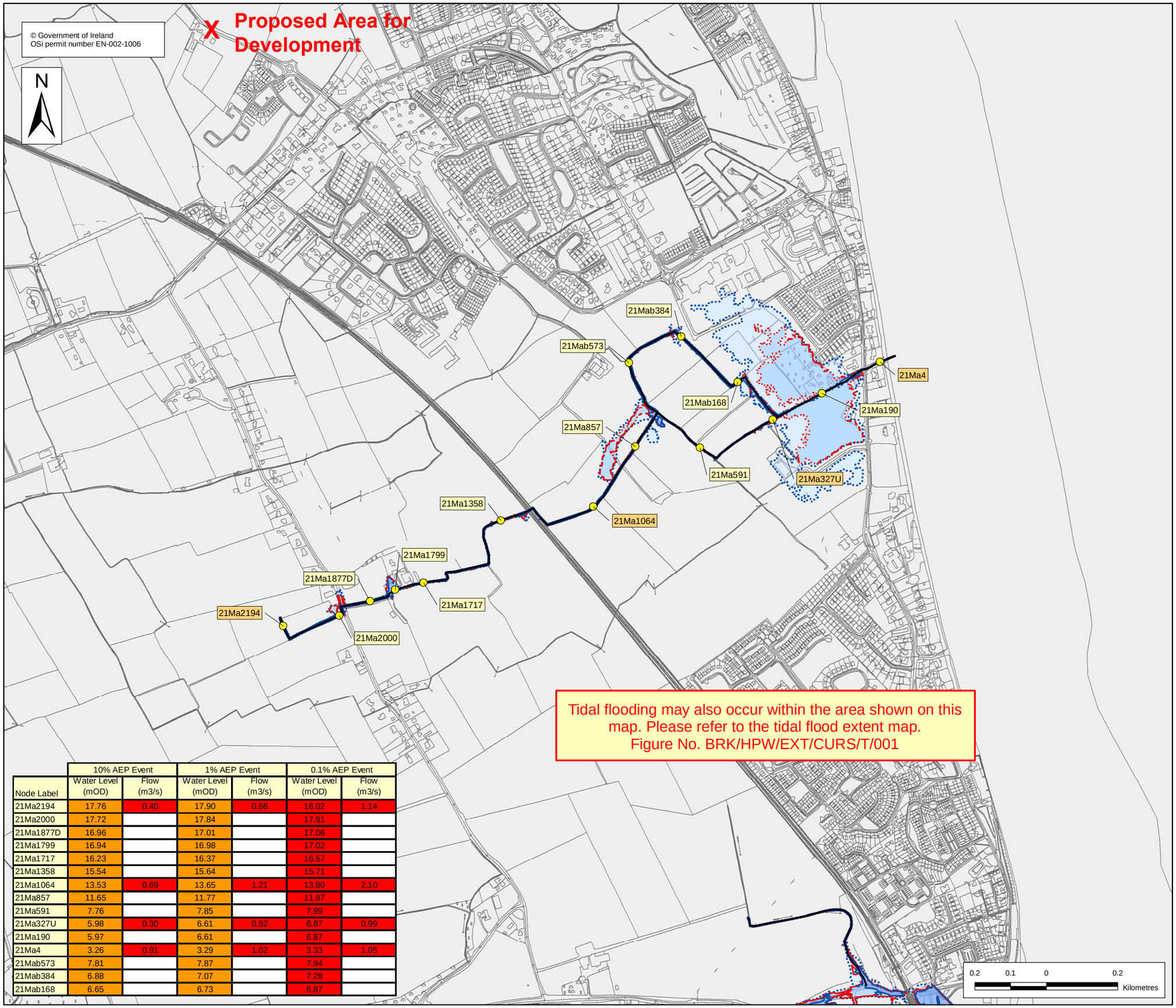
Map Type :	FLOOD EXTENT	
Source :	TIDAL FLOODING	
Map area :	HIGH PRIORITY WATERCOURSE	
Scenario :	CURRENT	
Figure By :	Mara Ruiz	Date : 17 January 2011
Checked By :	Sergio Herbón	Date : 17 January 2011
Approved By :	Clare Dewar	Date : 17 January 2011

Figure No. : BSS/HPW/EXT/CURS/T/001

Revision 1

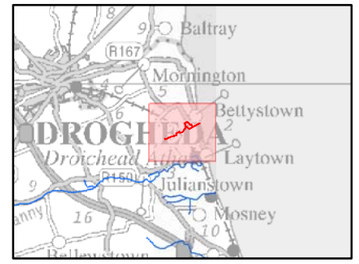
Drawing Scale : 1:10,000

Plot Scale : 1:1 @ A3



Node Label	10% AEP Event		1% AEP Event		0.1% AEP Event	
	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)
21Ma2194	17.76	0.40	17.90	0.66	18.02	1.14
21Ma2000	17.72		17.84		17.91	
21Ma1877D	16.96		17.01		17.06	
21Ma1799	16.94		16.98		17.02	
21Ma1717	16.23		16.37		16.57	
21Ma1358	15.54		15.64		15.71	
21Ma1064	13.53	0.69	13.65	1.21	13.80	2.10
21Ma857	11.65		11.77		11.87	
21Ma591	7.76		7.85		7.99	
21Ma327U	5.98	0.30	6.61	0.52	6.87	0.99
21Ma190	5.97		6.61		6.87	
21Ma4	3.26	0.91	3.29	1.02	3.33	1.05
21Mab573	7.81		7.87		7.94	
21Mab384	6.88		7.07		7.28	
21Mab168	6.65		6.73		6.87	

Location Plan :



EXTENT MAP

Legend:

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

High confidence
Medium confidence
Low confidence
refer to table

USER NOTE :

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Tel: +353-1-4975716

Clients :

Fingal County Council
Meath County Council
OPW

Project :
FEM FRAMS

Map :
BROOK SIDE STREAM MODEL FLOOD

Map Type :	FLOOD EXTENT		
Source :	FLUVIAL FLOODING		
Map area :	HIGH PRIORITY WATERCOURSE		
Scenario :	CURRENT		
Figure By :	Mara Ruiz	Date :	3 November 2010
Checked By :	Sergio Herbón	Date :	3 November 2010
Approved By :	Clare Dewar	Date :	3 November 2010

Figure No. : BSS/HPW/EXT/CURS/001

Revision 1

Drawing Scale : 1:10,000

Plot Scale : 1:1 @ A3

Appendix C – Arterial Drainage Scheme and Drainage District Maps

Active Layers Add Layer

Arterial Drainage Schemes (ADS)

Off ADS - Channels

Legend: Layer Queryable: No

Off ADS - Embankments

Legend: Layer Queryable: No

On ADS - Benefited Lands

Bogland: Layer Queryable: No

Benefited Land: Layer Queryable: No

Drainage Districts (DD)

On DD - Channels

Legend: Layer Queryable: No

200 m

Layers

Tools

B&W

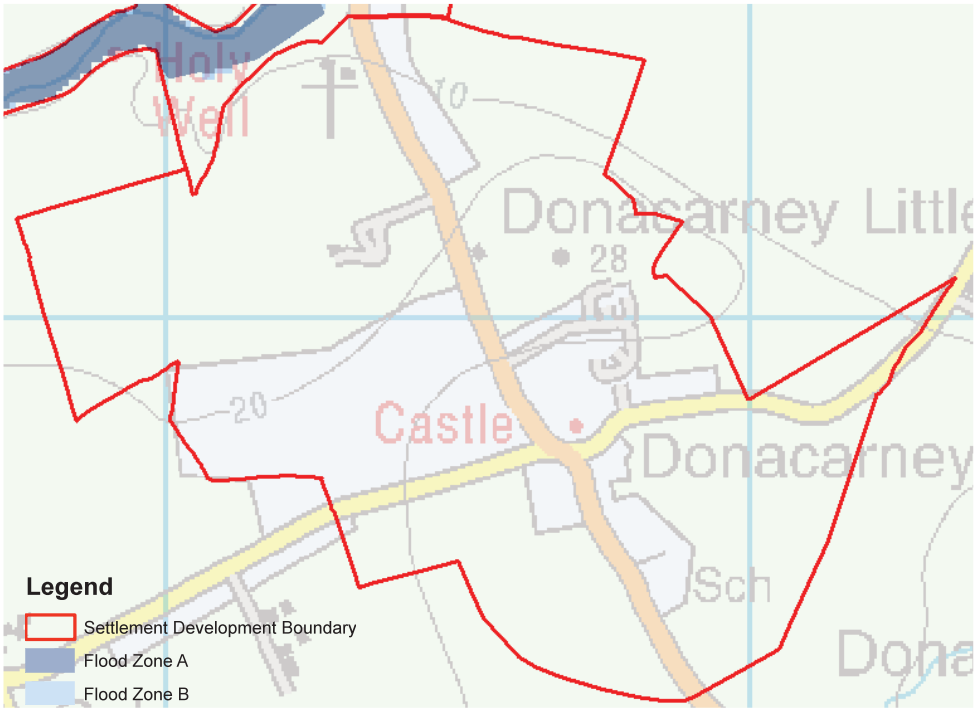
Satellite

OSi

i − +

Appendix D – Strategic Flood Risk Assessment Maps (2011)

A.9 DONACARNEY	
Settlement Area	97.85 Ha
Zoning within Flood Zone A and/or B?	No
Area for Further Assessment under CFRAM programme?	No



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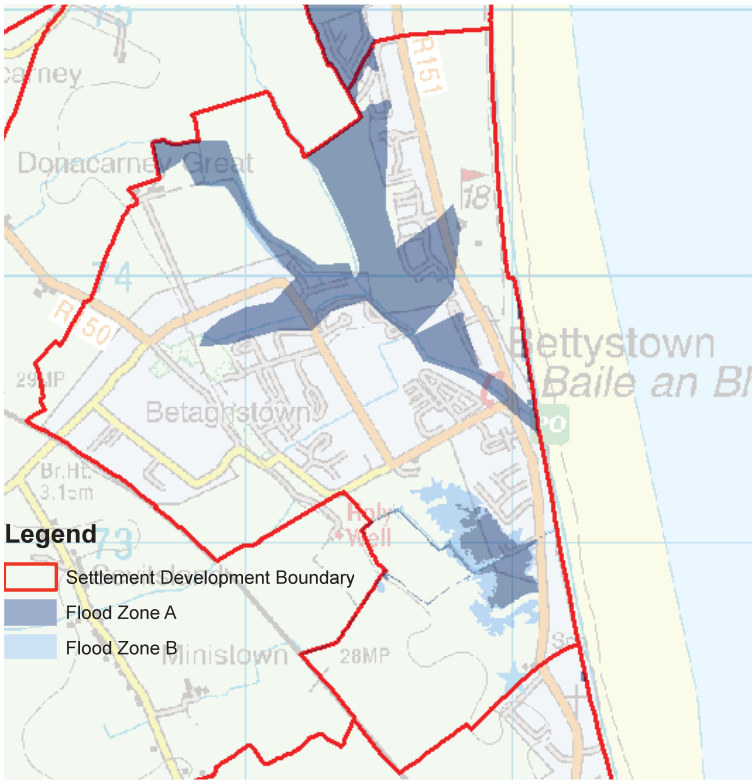
The Flood Zone mapping has been produced in accordance with the Planning Guidelines and therefore ignores the impact of flood protection structures. Areas protected by flood defences still carry a residual risk of flooding due to overtopping or breach, there may also be no guarantee of maintenance in 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	JFlow
Historical Flooding	Donacarney School R150 Recurring
Comment	No fluvial flood risk identified. Some potential for isolated areas of surface water ponding, recurring flooding reported on R150 near Donacarney school
Conclusion	No SFRA required Implement Flood Risk Management policies from CDP

A.4 BETTYSTOWN	
Settlement Area	313.84 Ha
Zoning within Flood Zone A and/or B?	Yes
Area for Further Assessment under CFRAM programme?	FEM FRAMS



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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	FEM FRAMS & PFRA
Historical Flooding	Mentioned - Mornington November 2000 and Piltown Meath Recurring
Comment	Flood risk in Bettystown is well defined in the southern end of the settlement as this watercourse was modelled under the FEM FRAMS. Significant flood risk is identified that will be a constraint to expansion of existing developed areas. It is recommended that flood risk and management options for the settlement are considered in more detail at the Lap stage, and take into account the recommendations of the FEM FRAMS and any potential overlap with the Mornington Flood Alleviation Study.
Conclusion	SFRA required at LAP stage, taking into account any recommendations of the FEM FRAMS