

Cairn Homes Properties Ltd



Strategic Housing Development Castletreasure

Flood Risk Assessment

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SECTION 1: Introduction

1.1 General

J. B. Barry and Partners Limited was commissioned by Cairn Homes to undertake a site-specific Flood Risk Assessment (FRA) at its site in Castletreasure, Douglas, Co. Cork for a planning application for a proposed housing development. The aim of the FRA is to identify, quantify and communicate to decision makers and other stakeholders the risk of flooding associated with the proposed development.

The FRA has been carried out in accordance with 'The Planning System and Flood Risk Management Guidelines' (hereafter referred to as the FRM Guidelines) published in November 2009 jointly by the then Department of the Environment, Heritage and Local Government, DEHLG, (now the Department of the Environment, Community and Local Government, DECLG) and the Office of Public Works (OPW).

The proposed development site is located along the Carrigaline Road in Douglas as shown in Figure 1-1 below. A portion of the site in the north eastern corner has been sold to the Department of Education for the development of a proposed new primary school, permitted under Cork County Council planning application ref. 18/5369/An Bord Pleanála.



Figure 1-1: Location of Proposed Development (Source: Google Maps, annotation by J.B. Barry & Partners)

1.2 Proposed Development

The proposed residential development consists of 472 no. dwelling houses and associated ancillary site works as shown in Figure 1.2 below.



Figure 1-2: Proposed Development at Castletreasure

SECTION 2: Flood Risk Assessment Methodology

2.1 Methodology

The methodology used for the flood risk assessment for the proposed development is based on 'The Planning System and Flood Risk Management, Guidelines for Planning Authorities' (2009). The FRM Guidelines require the planning system at national, regional and local levels to:

- Avoid development in areas at risk of flooding, particularly floodplains, unless there are proven wider sustainability grounds that justify appropriate development;
- Adopt a sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction and then mitigation of flood risk; and
- Incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

The sequential approach (see Figure 2-1 below) in flood risk management requires the following three steps to identify the necessity for the justification test for a development:

- Step 1: Identification of the Flood Zone at the proposed development site (Section 2.23 of the FRM Guidelines);
- Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines); and
- Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development.

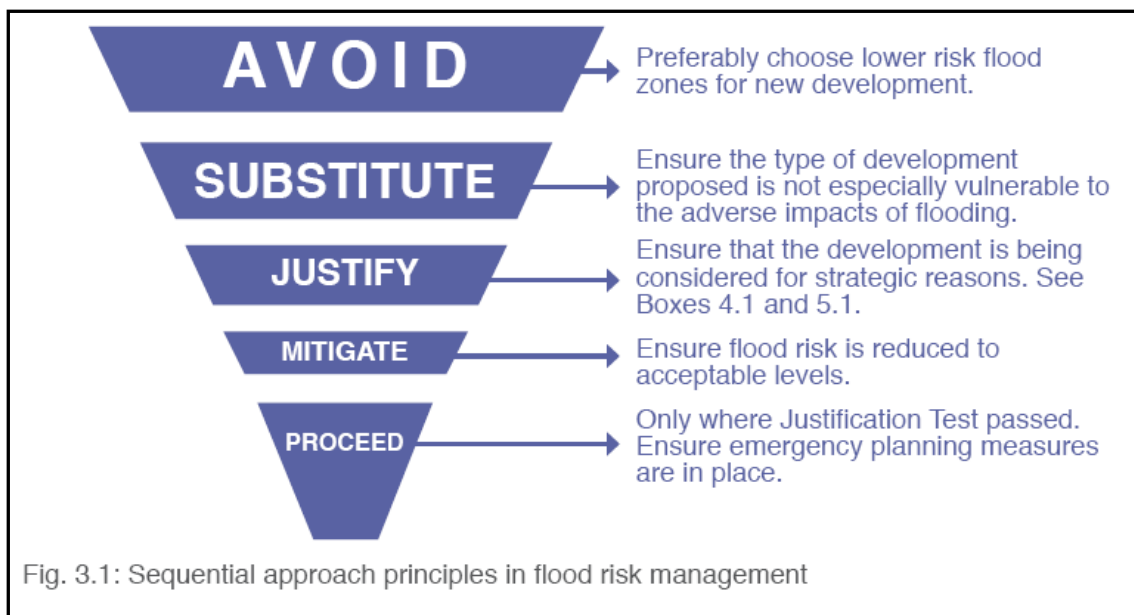


Figure 2-1: Sequential Approach Principles in Flood Risk Management

While Figure 3.1 of The FRM Guidelines sets out the broad philosophy underpinning the sequential approach in the flood risk management, Figure 3.2 of the Guidelines (shown below) describes the mechanism of the sequential approach for use in the planning process.

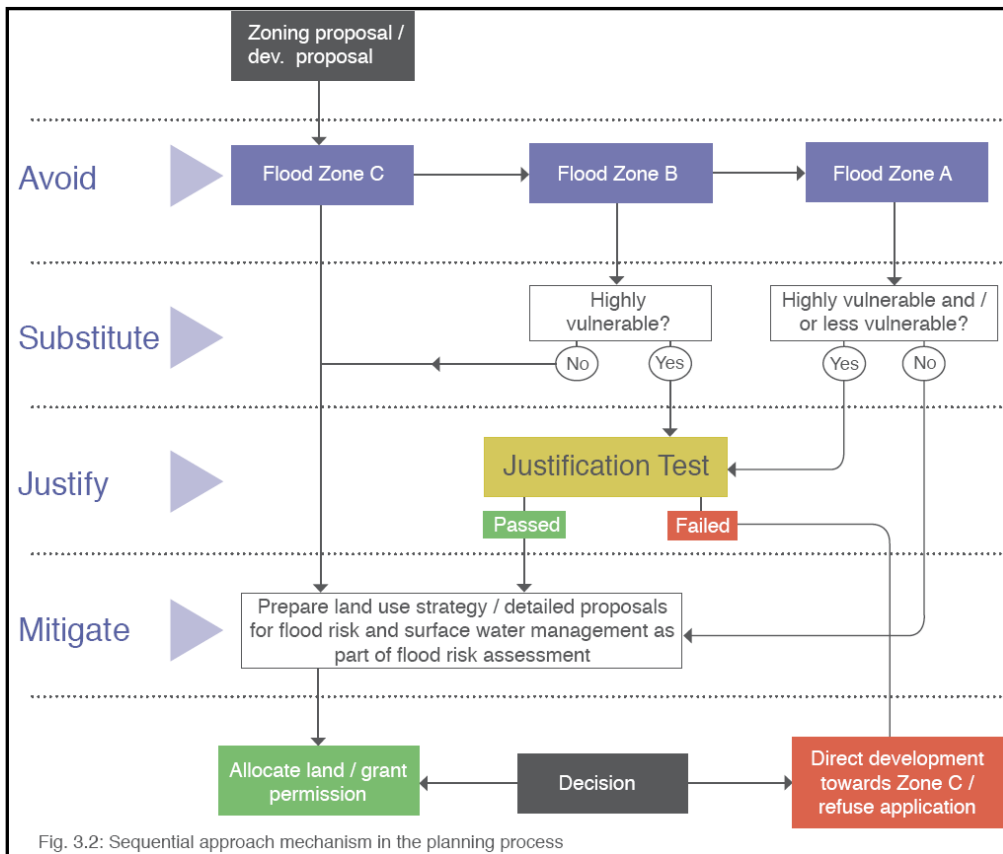


Figure 2-2: Sequential Approach Mechanism

According to the FRM Guidelines, Flood Zones are graphical areas within which the likelihood of flooding is in a particular range. They are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning. There are three Flood Zones, namely,

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% AEP or 1 in 100 year 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% AEP or 1 in 1000 year and 1% AEP or 1 in 100 year for river flooding and between 0.1% AEP or 1 in 1000 year and 0.5% AEP or 1 in 200 year for coastal 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 Zones A, B and C are based on the current assessment of the 1% AEP and the 0.1% AEP fluvial events and the 0.5% AEP and 0.1% AEP tidal events, without the inclusion of climate change factors. Figure 2-3 which is an extract from the FRM Guidelines (see below) shows the classification of the vulnerability to flooding of different types of development.

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

Table 3.1 Classification of vulnerability of different types of development

Figure 2-3: Classification of Vulnerability of Different Types of Development

Figure 2-4, an extract of the FRM Guidelines, identifies the types of development that would be appropriate for each Flood Zone and those that would be required to meet the Justification Test. Since dwelling houses are classified as 'Highly vulnerable development' the section highlighted in Figure 2-4 presents the required action for each flood zone.

	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 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

Figure 2-4: Matrix of Vulnerability

The FRM Guidelines (Chapter 2) outlines the following three stages of flood risk assessment:

Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues relating to the proposed development site that may warrant further investigations.

Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect the proposed development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. This stage involves the review of existing studies and hydraulic modelling to assess flood risk and to assist with the development of FRM measures.

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, of its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a hydraulic model across a wide enough area to appreciate the catchment wide impacts and hydrological process involved.

2.2 Data Collection

Data required for the flood risk assessment was obtained from various sources, as described below.

- The historic data was obtained from the National Flood Hazard Mapping website www.floodmaps.ie
- The Subsoil and Aquifer vulnerability data was obtained from the Geological Survey of Ireland website www.gsi.ie
- The Preliminary Flood Risk Assessment (PFRA) map was obtained from the Catchment Flood Risk Assessment and Management study website www.cfram.ie
- Ballincollig – Carrigaline Municipal District Local Area Plan 2017

SECTION 3: Existing Hydrological Environment

3.1 Salient Hydrological Features

The main hydrological features of the area are the Douglas and Moneygurney Streams which flow in a northerly direction through the site. The Moneygurney Stream flows in a north westerly direction through the site and forms a portion of the northern boundary of the site. The Douglas Stream flows in a northern direction along the western boundary of the site. The Douglas and Moneygurney Streams meet just downstream of the north western corner of the site to form the Ballybrack Stream (also referred to as the Douglas River and Donnybrook River). The Ballybrack Stream flows north through Douglas village before it is culverted under Douglas Shopping Centre and joins the tidally influenced Tramore River to the north of Douglas. The Ballybrack Stream is currently subject to flood alleviation works under the Douglas Flood Relief Scheme. Therefore, the importance of not increasing the flow in the Ballybrack Stream due to increased surface runoff arising from the proposed development is noted and measures to assure this are presented in this report. Figure 3-1 below illustrates the main hydrological features associated with the site.



Figure 3-1: Hydrological Features of the Area (Source: www.epa.ie, annotation by J.B. Barry & Partners)

3.2 Existing Geology and Hydrogeology of the Area

The Geological Survey of Ireland (GSI) website provides information on their public online mapping service at www.gsi.ie on subsoil type and aquifer vulnerability. The maps presented in Figure 3-2 and Figure 3-3 depict the subsoil type and aquifer vulnerability for the existing/proposed development site. The GSI subsoil mapping (Figure 3-2) indicates that deep well drained mineral is the dominant ground condition within the environs of the development site with traces of made ground and shallow well drained mineral nearby.

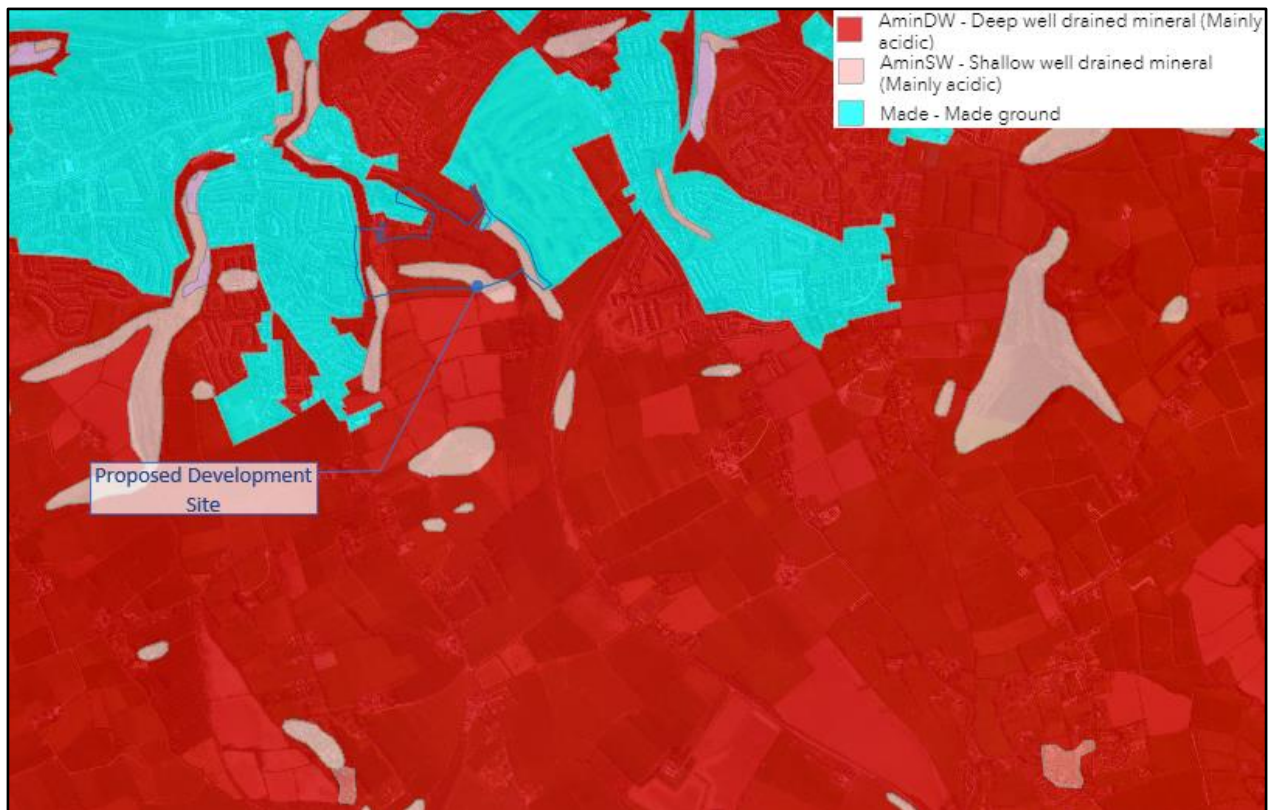


Figure 3-2: GSI Subsoil Mapping (Source: www.gsi.ie, annotation by J.B. Barry & Partners)

Furthermore, the interactive web-mapping site classifies the aquifer vulnerability in this region as having an extreme vulnerability rating with rock at or near surface present in areas (Figure 3-3). The GSI state that "Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities". The GSI further describes that the vulnerability of groundwater depends on:

- (i) The time of travel of infiltrating water (and contaminants);
- (ii) The relative quantity of contaminants that can reach the groundwater; and
- (iii) The contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate

Firstly, the vulnerability rating for an area indicates, and is a measure of, the likelihood of contamination. Secondly, the vulnerability map helps to ensure that a groundwater protection scheme is not necessarily restrictive on human economic activity. Thirdly, the vulnerability map helps in the choice of preventative measures and enables developments, which have a significant potential to contaminate, to be located in areas of lower vulnerability.

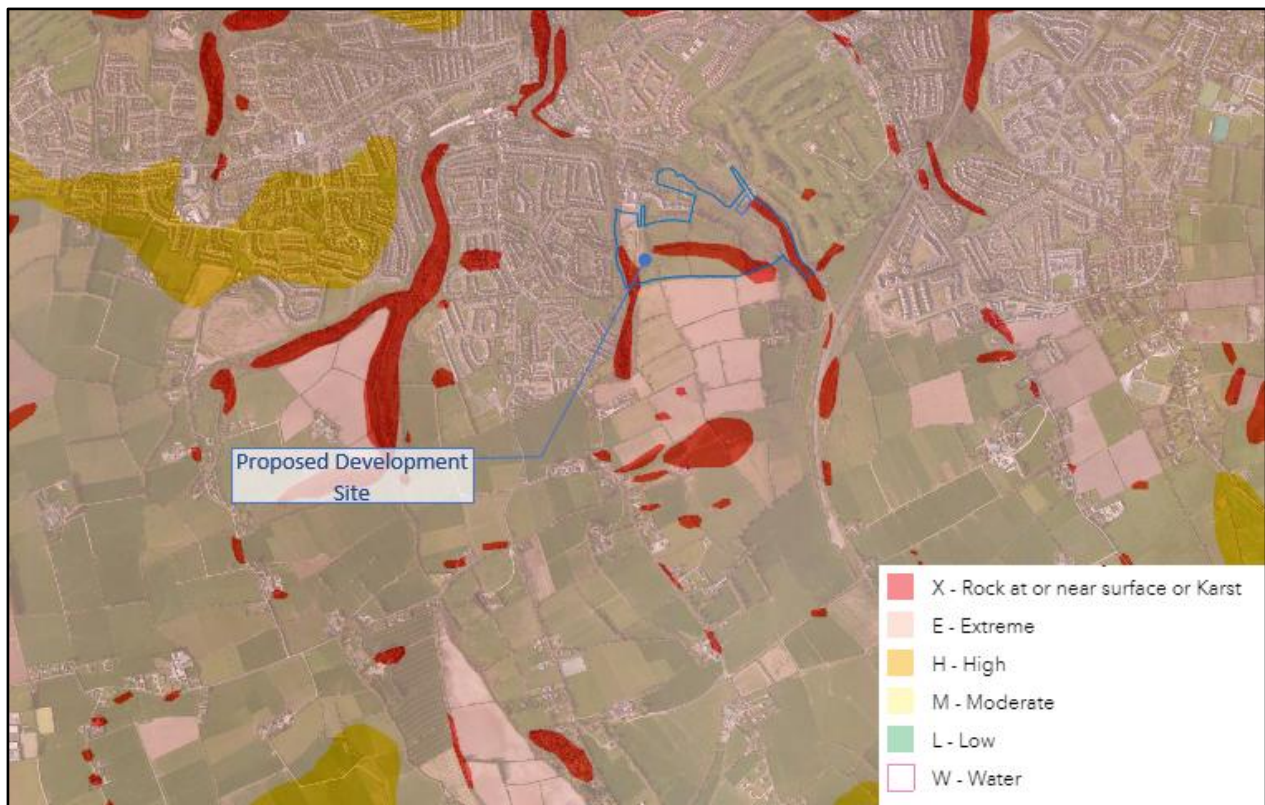


Figure 3-3: GSI Aquifer Vulnerability Mapping (Source: www.gsi.ie, annotation by J.B. Barry & Partners)

3.3 Flood Regime of the Area

The National Flood Hazard Mapping Website www.floodmaps.ie does not show any records of historic floods occurring at the proposed development site, however it does show records of historic flooding events downstream of the site in Douglas (Figure 3-4). The most recent of these flood occurred in June 2012 and was caused by overtopping of the Ballybrack Stream.

Extremely heavy rainfall and a steep catchment area gave rise to the flooding at Douglas in June 2012. The Ballybrack Stream burst its banks upstream of the village at a blocked bridge and entered local properties. Trash screens along the course of the river were blocked due to the volume of debris conveyed by the stream resulting in flood waters flowing onto roads and a park within Douglas.

A Summary Local Area Report (SLAR) was generated for the site, which identifies the flooding events, within the vicinity of the proposed development site (included in Appendix 1). Also included in Appendix 1 is a report compiled by the OPW following the flood event in June 2012. Following these floods Cork County Council, acting as Agents for the OPW has now commissioned the design and development of a Flood Relief Scheme for Douglas.



Figure 3-4: Location of historic flooding in the vicinity of the proposed site (Source: www.floodmaps.ie annotation by J.B. Barry & Partners)

3.4 Existing Flood Studies

3.4.1 Preliminary Flood Risk Assessment (PFRA) Maps

The proposed development is located within the South Western River Basin District (RBD) of Ireland. The OPW is working in partnership with their consultants, Local Authorities and other stakeholders to deliver the Catchment Flood Risk Assessment and Management (CFRAM) study for the RBD. In the meantime, the OPW had published the Preliminary Flood Risk Assessment (PFRA) maps, in the form of 420 maps covering the country. According to the explanatory leaflet published for public consultation on PFRA stage, the PFRA is only a preliminary assessment, based on available or readily derivable information. It also states that areas where an on-site inspection is required to investigate the issues more closely, then those inspections will be carried out as part of the CFRAM Studies.

The PFRA map (extract) is shown in Figure 3-5 below and in Appendix 2 indicating the fluvial, pluvial and coastal flood extents for the proposed development site location. Observation of the PFRA flood map extract indicates that the eastern portion of the site along the route of the Moneygurney Stream is located within the fluvial – indicative 1% Annual Exceedance Probability (100-yr) event and fluvial extreme events. Consequently, the proposed development site is partially situated within **Flood Zone A** where the probability of fluvial flooding is greatest, as stipulated by the FRM Guidelines. The PFRA map indicates that no groundwater flood risk or pluvial flood risk exists near the proposed development site.

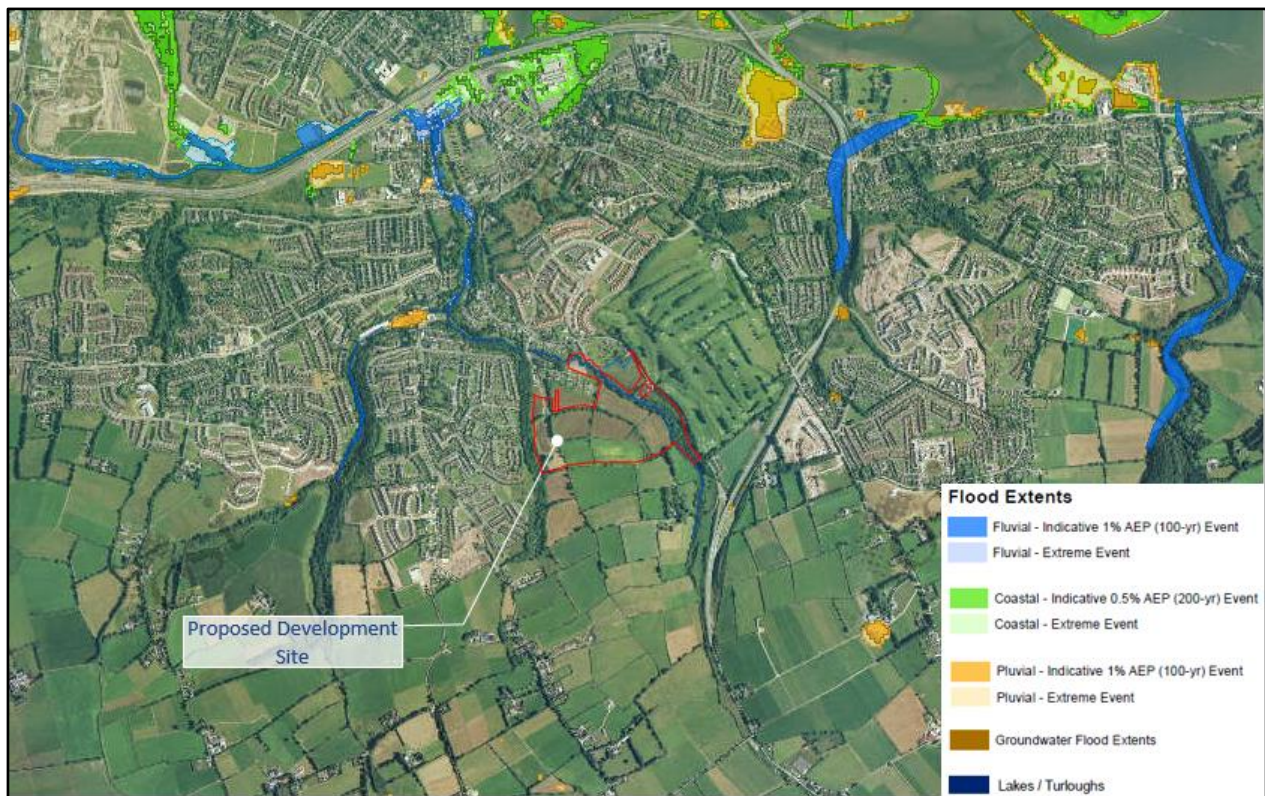


Figure 3-5: Extract of the PFRA map in the vicinity of proposed development site (Source: www.myplan.ie, annotation by J.B Barry & Partners)

3.4.2 Ballincollig – Carrigaline Municipal District Local Area Plan 2017

The Ballincollig – Carrigaline Municipal District Local Area Plan was released to the public in 2017 and it sets out the assessment and management of flood risks in relation to planned future development in the local area. Cork County Council had arranged for the preparation of indicative flood risk mapping on a county wide basis in the 2011 Local Area Plans. As part of the preparation for the 2017 MD plan the indicative flood zone maps have been updated to take account of the information that has become available from the National CFRAM programme and further flood schemes undertaken by the OPW.

Figure 3-6 below shows an extract of the indicative flood zone mapping at the proposed development site. Observation of Figure 3-6 demonstrates that both the Moneygurney and Douglas Streams overtop their banks during the 1% AEP fluvial flood event, resulting in the proposed development site being partially located within fluvial **Flood Zone A** at these locations. This is consistent with the PFRA Map as shown above.

The LAP also states "when planning a development upstream of an area at risk of flooding, intending developers need to be mindful of the need to consider the potential downstream flood impacts of a development, even when the development itself is not in an area of flood risk. This relates in particular to the management of surface water and to wider issues of pluvial flood risk, which may have downstream impacts. Detailed assessment of the potential downstream impacts is particularly important in areas where flood defences have already been provided or are planned downstream of a development, in order to ensure that there are no adverse effects on the standard of defence provided." As the Douglas Flood Relief Scheme is being developed downstream of the proposed development the appropriate management of surface water will be a primary focus during the design of the proposed development.

SuDS measures will be implemented on site in order to limit the discharge of stormwater and associated surface runoff arising on site to the greenfield discharge rates. SuDS measures such as permeable paving, filter drains and attenuation systems will be incorporated into the surface water drainage system. These SuDS measures will ensure that there will be no increased surface runoff from the development in comparison to that of the pre-development condition.



Figure 3-6: Extract from the Ballincollig - Carrigaline Municipal District LAP (Source: www.corklocalareaplans.com, annotation by J.B. Barry & Partners)

SECTION 4: Flood Risk Assessment

4.1 Introduction

As outlined in Section 2 of this report the FRM guidelines identifies three stages of Flood Risk Assessment namely;

- Stage 1: Flood Risk Identification
- Stage 2: Initial Flood Risk Assessment
- Stage 3: Detailed Flood Risk Assessment

4.2 Flood Risk Identification

According to the FRM Guidelines, flood risk identification is the process for deciding whether a plan or project requires further investigation. This is a desk-based exercise based on existing information. All the existing information is described in Section 3 and the identification of flood risk from each of the five sources of flooding (coastal, fluvial (river), groundwater, pluvial (rainfall) and from artificial drainage systems) is considered.

Coastal Flood Risk

The PFRA map in Appendix 2, and Ballincollig – Carrigaline Municipal District Local Area Plan flood map in Figure 3-6 both indicate that the proposed development site lies outside of the 0.1% AEP coastal flood event and hence is located within **Flood Zone C** for Coastal flood risk, where the risk of flooding is low.

Fluvial Flood Risk

The PFRA map in Appendix 2, and Ballincollig – Carrigaline Municipal District Local Area Plan flood map in Figure 3-6 both indicate that a small portion of the site lies within the 1% AEP fluvial flood extent. Therefore, a small portion of the proposed development site lies within Fluvial **Flood Zone A** – high flood risk. The OPW Summary Local Area Report shows no indication of previous fluvial related flooding at the proposed site.

Groundwater Flood Risk

The aquifer vulnerability map (refer to Figure 3-3) classifies the site as having 'extreme vulnerability' which indicates a high water table and hence a risk of groundwater related flooding. Despite this, there is no historical evidence of groundwater flooding at the site and the PFRA Map (Appendix 2) indicates a low risk of groundwater related flooding. There is no indication on the maps of any springs or wells on this site. Groundwater risk is therefore not considered to be significant.

Pluvial Flood Risk

The PFRA Map (Appendix 2) of the area does not show any pluvial flood risk at the site and the OPW Summary Local Area Report also shows no indication of previous pluvial related flooding at the site. Pluvial flood risk is therefore not considered to be significant. Notwithstanding this, it is important to consider appropriate mitigation measures. During extreme rainfall events the application of SuDS principles will ensure surface water is managed sufficiently and sustainably discharged to the drainage network.

Artificial Drainage Systems Flood Risk

No artificial drainage systems have been identified at the proposed site, and consequently artificial drainage systems flood risk is not relevant.

4.3 Initial Flood Risk Assessment

The Flood Risk Assessment has identified that there is a flood risk to the site. Under the sequential approach identified in the FRM Guidelines a three step approach is required to confirm the appropriateness of the development in terms of flood risk.

Step 1: Identification of the Flood Zone at the proposed development site

Using the Flood Zone criteria from the FRM Guidelines and as defined in Section 2 previously, the flood zones for each of the sites were determined.

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 year 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 100 year and 1% or 1 in 1000 year for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 year 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).

As discussed in Section 4.2 above, a small portion of the proposed development site lies within **Flood Zone A**.

Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines)

The different types of proposed infrastructure are then assigned a vulnerability classification according to the definitions in 'Table 3.1 – Classification of vulnerability of different types of development' of the FRM Guidelines.

As described in Section 1.2 above, the proposed development consists of residential dwellings. Dwelling houses are classified as 'highly vulnerable development'.

Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development

Part of the proposed development site is located in Flood Zone A, and is categorised as Highly Vulnerable Development. Table 3.2 of the FRM guidelines and Figure 3.2 – Sequential approach mechanism in the planning process (FRM guidelines) stipulate that a justification test is required for such a development before it is deemed appropriate development for the flood zone categories. Figure 4.1 below highlights the sequential approach and the matrix of vulnerability versus flood zone.

	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 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

Figure 4-1: Matrix of Vulnerability versus Flood Zone to illustrate appropriate development

4.4 Detailed Flood Risk Assessment

4.4.1 Justification Test

According to the FRM Guidelines, the Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of particular developments that are being considered in areas of moderate or high flood risk (Flood Zones A and B; respectively).

The FRM Guidelines outlines in Box 5.1 (shown in Figure 4.2), the five criteria, namely Criterion 1, 2(i), 2(ii), 2(iii), and 2(iv), all of which must be satisfied under the Justification Test as it applies to development management. These justification criteria have been addressed in the following paragraphs.

Box 5.1 Justification Test for development management (to be submitted by the applicant)	
When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied:	
1.	The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.
2.	The proposal has been subject to an appropriate flood risk assessment that demonstrates: <ul style="list-style-type: none"> (i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk; (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible; (iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and (iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.
The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.	
Note: See section 5.27 in relation to major development on zoned lands where sequential approach has not been applied in the operative development plan.	

Figure 4-2: Box 5.1 extract from the FRM Guidelines

Criterion 1: The subject land has been designated for this particular use

The proposed residential development will be built within the Ballincollig – Carrigaline Municipal District. The interactive map browser for the Ballincollig – Carrigaline Municipal District Local Area Plan identifies that the proposed development site is zoned for residential purposes. Figure 4-3 below shows an extract of the interactive map browser demonstrating the residential zoning designated to the proposed development site. With this, it is considered that the development fulfils Criterion 1 of the Justification Test.



Figure 4-3: Extract of Interactive Ballincollig – Carrigaline Municipal District Local Area Plan Land Zoning Map

Criterion 2: The proposal has been subject to an appropriate flood risk assessment

To satisfy the four sub-criteria (namely 2(i), 2(ii), 2(iii), 2(iv)) under this criterion, as set out in Box 5.1 of the FRM Guidelines, a detailed flood risk assessment has been undertaken.

A detailed and appropriate flood risk assessment has been undertaken under the four sub-criteria of Criterion 2 of the Justification Test, as described below:

- Sub-criterion 2 (i) – Detailed flood risk assessment
- Sub-criterion 2 (ii) – Flood risk mitigation measures
- Sub-criterion 2 (iii) – Residual risks
- Sub-criterion 2 (iv) – Wider planning objectives

Each sub criterion is addressed in the following sections.

Sub Criterion 2(i) – Detailed Flood Risk Assessment

As mentioned above, a small portion of the proposed development lies within the 0.1% AEP floodplain of the Douglas Stream and Moneygurney Stream. Development on a floodplain has the potential to increase flood risk elsewhere by:

- Increasing the rate and volume of runoff from reduced permeable areas
- A decrease in the volume of available flood storage

The use of appropriate SuDS measures will mitigate the impacts set out in bullet point one above. Excess surface runoff arising from the development site will be attenuated and discharged at the greenfield discharge rate. Therefore, it is considered that there will be no increased surface runoff from the development in comparison to that of pre-development condition.

As discussed above, a small portion of the site of the proposed development lies within the 1% AEP fluvial flood extent. However, all residential dwellings will be constructed in areas that are not vulnerable to flooding. Only a small number of houses along the western boundary of the site are located close to the area of possible fluvial flooding from the Douglas Stream.

The Ballincollig Carrigaline Municipal District Local Area Plan flood map is believed to be the most accurate flood study undertaken in the area. The LAP states that the 2011 flood zone mapping has been updated to take account of information that has become available in the CFRAM Study and other flood schemes undertaken by the OPW. As such, the fluvial flood extent map as shown in Figure 3-6 has been extrapolated and superimposed onto the results of a topographical survey of the proposed development site. An extract of this is shown in Figure 4-4 below. Observation of Figure 4-4 demonstrates that the extreme fluvial flood event extends to a level of approximately **+40.5mOD**. The proposed site layout was also superimposed onto the flood extent map and this demonstrated that all residential development will be located outside of the 0.1% AEP fluvial flood extent. Therefore there will be no discernible increase in flood risk elsewhere as there will be no decrease in the volume of the existing floodplain storage. With this, it is considered that the proposed development satisfies sub-criterion 2(i) of the Justification Test.



Figure 4-4: Overlay of Fluvial Flood Extent Map and Proposed Development Layout and Topography

Sub Criterion 2(ii) – Flood Risk Mitigation Measures

As discussed in Section 4.2, the main risk of flooding at the site is from fluvial flooding. It was identified that the western portion of the site is immediately adjacent to the 0.1% AEP fluvial flood extent from the adjacent Douglas Stream. Superimposing the topographical survey on to the fluvial flood extent map identified that the 0.1% AEP flood level is +40.5mOD.

According to the FRM Guidelines, the minimum floor level for a new development should be set above the 1% AEP fluvial flood level and should include an allowance for climate change and freeboard. It is recommended to construct the finished floor level (FFL) of the residential dwellings in the vicinity of the fluvial flood extent at a level greater than the 0.1% AEP flood level with an allowance for freeboard and climate change. A conservative freeboard of 0.6m is recommended to account for any uncertainty in the flood maps and an allowance of 0.3m is recommended for the effects of climate change. This results in a recommend minimum FFL of the development as **+41.4mOD** (40.5mOD + 0.6m + 0.3m). This FFL is not only above the 1% AEP flood level in accordance with the FRM Guidelines but is also above the 0.1%

AEP flood level with an allowance for climate change and suitable freeboard. For the apartment blocks with basement car park, the elevation of the entrance/exit to the basement car parks shall be above +41.4mOD. With this, the proposed development satisfies Sub-criterion 2(ii) of the Justification Test.

Sub Criterion 2(iii) – Residual Risks

With the implementation of flood risk mitigation measures recommended above, it is considered that the risk of flood damage to the proposed infrastructure and to operators will be minimised.

The proposed development will have no direct access to any nearby watercourse with the boundary of the site being fenced off from the Douglas and Moneygurney Streams. It is considered that the proposed development satisfies sub-criterion 2(iii) of the Justification Test.

Sub Criterion 2(iv) – Wider Planning Objectives

The development will address the above measures in a manner that is compatible with the wider planning objectives in relation to the proposed development. Therefore, it is considered that the development also satisfies Sub-criterion 2(iv) of the Justification Test.

SECTION 5: Conclusions and Recommendations

5.1 Summary of Results

A flood risk assessment for the proposed housing development at Castletreasure, Douglas, Co. Cork has been undertaken in accordance with the methodology recommended in the FRM Guidelines. The following is a summary of the flood risk assessment:

- The proposed development consists of the construction of 472 no. residential dwellings and associated ancillary site works in Castletreasure, Co. Cork. The Douglas Stream flows along the western boundary of the site and the Moneygurney Stream flows along the eastern boundary of the site. These two streams meet to the North of the site and continue to flow through Douglas village as the Ballybrack Stream.
- The PFRA flood extent map and the Ballincollig Carrigaline Municipal District LAP both indicate that a small portion of the existing site lies within Flood Zone A. The national flooding website www.floodmaps.ie does not have any record of historic flooding at the site.
- The type of development is defined as 'Highly Vulnerable Development (including essential infrastructure)'. Using the sequential approach mechanism it is assessed that a justification test is required for the proposed development.
- The proposed development was considered to be appropriately designated to the required zoned lands according to the Ballincollig Carrigaline Municipal District Local Area Plan.
- It was identified that all proposed dwellings will be constructed outside of the 0.1% AEP fluvial flood extent. A small number of dwellings to the west of the site are within close proximity to the 0.1% AEP flood and the development was subject to a detailed flood risk assessment which has confirmed that all proposed dwellings will be constructed outside the 0.1% AEP fluvial flood extent.
- The Ballincollig Carrigaline Municipal District LAP flood extent map was superimposed and overlaid onto the site layout plan and topographical survey of the site. Observation of this demonstrated that all proposed houses and highly essential infrastructure is to be outside of the 0.1% AEP flood extent. It was determined that the 0.1% AEP flood level of the Douglas Stream in this area is +40.5mOD.
- All development, including highly essential infrastructure, will be constructed at an elevation higher than the 1% AEP flood level with a suitable freeboard. The proposed FFL of buildings will also be greater than the 0.1% AEP flood level. Consequently, construction of the proposed development will not result in the loss of flood plain storage, and as such will have no impact on the remaining flood plain.
- Appropriate SuDS measures will ensure there is no increase in surface runoff from the proposed development. Excess surface runoff arising from the development site will be attenuated and discharged at the greenfield discharge rate.
- Following the procedures as set out in the FRM Guidelines it was deemed that the site satisfied all criteria and thus satisfied the Justification Test.

5.2 Recommendations

To protect the proposed development against flooding, it is recommended that the development is constructed with a finished floor level (FFL) above the 1% AEP fluvial flood event. The FFL should incorporate a freeboard of 0.6m and a further 0.3m allowance for the effects of climate change. Therefore, the minimum FFL should be (+40.5m OD + 0.6m + 0.3m) **+41.4mOD**. The design has incorporated this recommendation and all proposed units have a FFL above the minimum recommended

FFL. It is recommended that surface water runoff at the site is managed by applying appropriate SuDS measures.

5.3 Impact of the proposed development on the existing flood regime of the area

To prevent any increased flooding at the downstream reach of the Ballybrack Stream (which may impact on the proposed Douglas Flood Relief Scheme) from the proposed development, it is proposed to implement SuDS measures in order to limit the discharge from the site to the greenfield discharge rates. These SuDS measures are discussed in detail in the Engineering Infrastructure Report. The implementation of these SuDS measures will ensure that there will be no increase in runoff to the Ballybrack Stream resulting from the development and therefore the development will have no impact on the proposed Douglas Flood Relief Scheme.

Appendix 1:

OPW Summary Local Area Reports

Summary Local Area Report

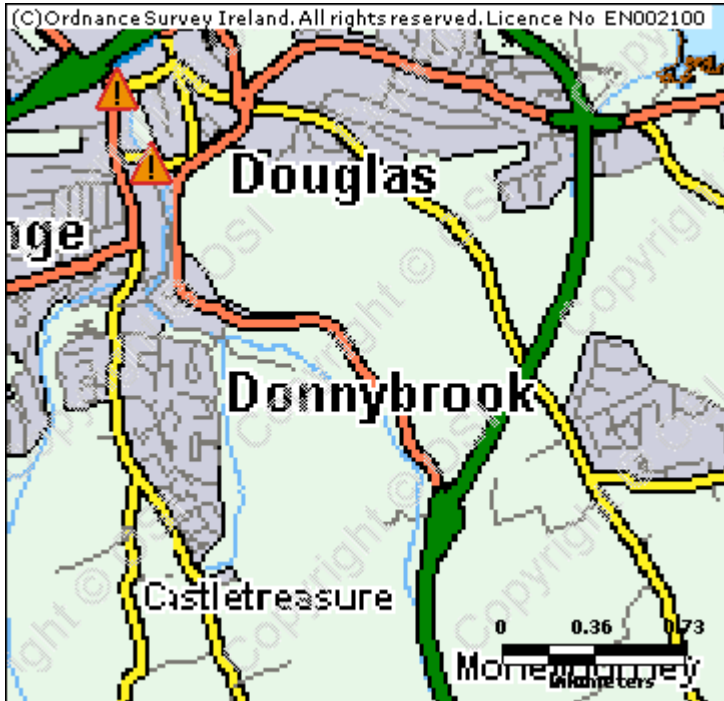
This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Cork

NGR: W 708 683

This Flood Report has been downloaded from the Web site www.floodmaps.ie. The users should take account of the restrictions and limitations relating to the content and use of this Web site that are explained in the Disclaimer box when entering the site. It is a condition of use of the Web site that you accept the User Declaration and the Disclaimer.



Map Scale 1:30,177

Map Legend	
	Flood Points
	Multiple / Recurring Flood Points
	Areas Flooded
	Hydrometric Stations
	Rivers
	Lakes
	River Catchment Areas
	Land Commission *
	Drainage Districts *
	Benefiting Lands *

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained in the Glossary.

2 Results



1. Flooding at Douglas, Co. Cork, 28th June 2012

Start Date: 28/Jun/2012

County: Cork

Flood Quality Code:3

Additional Information: [Reports \(2\)](#) [More Mapped Information](#)



2. Ballybrack Stream Douglas Nov 2002

Start Date: 20/Nov/2002

County: Cork

Flood Quality Code:3

Additional Information: [Reports \(3\)](#) [Press Archive \(1\)](#) [More Mapped Information](#)

Flood Report for the Carrigaline area, November 2002

Towards the end of the month of November 2002 the whole country received an exceptional amount of rainfall over a short period of time. One of the worst effected areas of the country was the Carrigaline area in south Cork.

Downpours of rain hit the area continuously over a two-week period. Peak rainfall figures occurred on Wednesday 20th when 40mm of rain fell from 6pm-6am and again on Wednesday morning 27th from 5am-7am when 18.6mm fell. These massive volumes of rain that fell over such short periods of time resulted in widespread damage across the area to roads, houses, schools and businesses.

There was widespread flooding in the area on Thursday 21st when Togher, Ballygarvan, Ballinhassig, Fivemilebridge, Douglas Village were all badly effected.

The Togher area was particularly badly hit on the Thursday morning when schools had to be closed and local houses got flooded. The damage then spread further throughout the area on the following Wednesday morning the 27th when the office was inundated with complaints from Carrigaline Town, Raffeen, Passage, Monkstown as well as all the areas that were damaged the previous week. These were the worst complained areas although there were many others.

The vast volumes of rain that fell over such short periods of time coupled with high tides in many areas meant that the drainage pipes and gullies simply couldn't take the amount of water flowing.

The problems in the Togher area are well documented and stem from the ongoing problems at Southern Fruit.

Included in this report is a list of the worst effected roads and damage reports from those roads. There is also a list of the houses, schools and businesses that were damaged in the floods.

List of Roads worst Effected and Damage Reports for the Carrigaline Area

Raffeen Bridge (R610):

A
There was water streaming across the road coming through local residents lands above the road and flowing into the stream below the road. The bank on the lower side of the road was being eroded away and there is a danger that the water may begin to take some of the road with it. Council workers went to work with the JCB to sure it up for the time being but repair works will need to be done in the future to prevent subsidence of the road. The lower bank will have to be reinstated with boulders and earth.

Monastery Road (LP2474):

B.
When I arrived on the scene (11.30) council workers were clearing the drains and the extensive flooding was abating. Earlier in the morning the flooding was apparently much worse rendering the road almost impassable. A large volume of gravel had gathered in three specific areas of the monastery road. The road was treacherous here, as the gravel had gathered in mounds up to 35mm high and 20 meters long, traversing most of the road in some places. On the left hand side of the road going up the hill, the verge was eroded very badly in one particular place. Directly at the side of the road was eroded down to some 2-3 feet in places at the roads edge. This represented a huge danger if a car was to go off the road.

Ballea Road (LS6487):

7.
One of the worst effected roads in the area was the Ballea Road. The Owenboy River flows alongside this road and the river was at the same level and overflowing the road in some places. The Ballea Bridge lower was the worst affected area with the road being submersed in several feet of water rendering the road impassable. There were a number of vehicles at the scene, which had to be abandoned. Because of the high tide at the time and the river overflowing its banks the road remained in this state of flood for most of the day.

Ballyfeard Road (R611):

c.
We received a lot of complaints regarding the Ballyfeard road. When I inspected the road I found there to be gravel scattered along the road in a number of different places. The water had also eroded away some sections of the roads edge leaving behind potholes that were more long and wide than deep. If not addressed though the road will break up and deteriorate further as it is a busy roadway.

Commeen hill (LP2495):

D.

Another area we received many complaints about was the Commeen hill area. Going out from Carrigaline there was a deposition of debris on the bridge at the fork in the road. As I went further up the hill the road was subsiding on both sides and had become considerably narrower than before. It would have been impossible for two cars to pass on the hill. Council workers had placed cones on either side of the road as warning and protecting the cars from going into the ditch. The ditch was as deep as two feet on some parts of the hill.

Carrigaline-Ballinhassig (R613):

6

There was a large amount of gravel deposited at each of the junctions off the R613 onto the minor roads. i.e. Ballinreesha cross roads, Killanully, Olen cross roads, Ballyduhig, Black Hill and Tullig More. The road beyond Bowens cross going towards Liss cross also experienced a deposition of gravel.

Liss Cross (LS6460):

13

We received complaints that a ditch had collapsed at the bridge just beyond Liss cross. The bridge is situated at a dip in the road known locally as 'lousy dip'. On inspection I saw that the ditch had collapsed and there was a danger that the side of the road would begin to subside if remedial works were not done. Council workers had placed warning signs on the road as a short-term precautionary measure.

Spur Hill (LP2452):

E

There were a few places on Spur Hill with potholes and loose gravel on the roadway. The worst effected part of this area though was at the bridge on the far side from the Dougheloyne area of Spur Hill. A considerable amount of water was flowing continuously onto the road. This had resulted in a number of potholes and a large amount of gravel forming on the bridge and further up along the road.

List of Places/Property Effected by Flood Damage in the Carrigaline Area

Togher:

Greenwood Estate (House Numbers 11-36 & 65) damaged to varying degrees 14
(Garage) Togher Road. 14

Togher Boys National School 14

Togher Girls National School 14

Palmbury Orchard, House Numbers 75 – 82 (Serious damage) *localised surface water problem.*

Fivemilebridge:

Fivemilebridge E

R600, Ballygarvan

Possibly two other properties

Adamstown,

Ballygarvan:

(Shop & Post Office), Ballygarvan Village 13

Ballygarvan Village 13

Brook House, Glen Road, Ballygarvan 13

(R600), Bowens Cross, Ballygarvan 13

Ballygarvan GAA Club 13

Ballygarvan Village 6

Ballygarvan Village 13.

Carrigaline Town:

Up to 20 businesses in the southern end of the Main Street

Including Centra, Pharmacy, Bar & Restaurant 16

Mount Rivers Estate (95 – 98 inclusive) Serious damage

Kilmoney Road

Douglas Village:

ICA Hall, (Serious damage) 12

1 & 2 Ravensdale, Church Rd. (Serious damage) 12

Shop (now trading as a hairdresser) 12

Ballinhassig:

Sportsmans Rest, Ballinhassig F

Coolmore:

G.

MINUTES OF MEETING

Reference: P4D403A – F310 – 010 – 004 – 2597 Page 1 of 3

Project No.: P4D403A

Project Title: OPW Flood Hazard Mapping – Phase 1

Purpose of Meeting: Data Collection – Cork County Council - South Cork –Carrigaline Area

Participating: Area Engineer Cork County Council
Search Manager ESBI

Venue: Carrigaline

Date of Meeting: 12/04/2005

Copies to: File

Compiled by: Search Manager

Status: Final

Approved for ESBI: Search Manager

Date: 15/03/06

Meeting with Area Engineer for Carrigaline Area 12/04/2005

The Area Engineer outlined areas that are or were prone to flooding. The locations were marked up on paper maps and labelled appropriately. Photos where available were provided indicating flooding or flood damage.

A number of reports were provided also.

1. Southern Fruits, Doughcloyne, Cork City Nov 2002, photo provided Road flooding due to heavy rain – Flood ID 1360
2. Ballygarvan, Co. Cork Nov 2002, photos provided, runoff from high ground caused flooding and deposition of material on roads, public house and post office flooded in village. 25mm of rainfall in 3hrs. Flood ID 5070
3. Paddys Block, Ringaskiddy, road flooding from a combination of heavy rainfall and extreme tidal conditions – Oct 2004. Flood ID 1364
4. Currabinny pier, coastal flooding, photos show resultant flood damage. Flood ID 5080
5. Sarsfield Road, Wilton, Cork City Jan 1993. Road flooding occurred at a low point on the road, the road was blocked for a period. Road layout has changed since the National Primary route was constructed and the road level was raised. Flood ID 1366 & 5325
6. Carrigaline Walk on Owenboy Estuary, Co. Cork – walk was flooded due to high tide levels in estuary. Photos show effects on 3/11/1994. Flood ID 1367
7. Ballea bridge lower, river flooding from the Owenboy River. Breaks banks and floods road. – recurring & Nov 2002 Flood ID 1368 & 5071
8. Road and land flooding in vicinity of Ballygarvan November 2002. Runoff from high ground. Flood ID 1369
9. Road flooding on R611 and some land flooding in vicinity of Shannonpark in Nov. 2002 due to collapsed culvert. New culvert installed and no flooding problems have been noticed since then. Flood ID 1370
10. Myrtleville costal flooding due to high tides and extreme wave action. Debris marks evident from photos. Flood ID 1371 & 5063
11. Fountainstown Strand costal flooding due to high tides and extreme wave action. Carpark flooded and road adjacent to strand blocked by a mixture of debris and flood water – Oct 2004. Flood ID 5062
12. The Point Crosshaven, coastal flooding from high tide and extreme wave action. Property damage, boundary wall collapsed – Oct 2004. Flood ID 5066

13. Graball Bay, coastal flooding from high tide and extreme wave action. Photos of damage resulting from flooding. Flood ID 5064
14. Pouladuff road – land and road flooding due to blockage in stream caused by cable drums November 2002. Flood ID 1358
15. Ringabella coastal flooding due to high tide and extreme wave action some minor subsidence and flood damage evident in photos Oct 2004. Flood ID 5079.
16. Robert's Cove coastal flooding due to high tides and extreme wave action, photo of material deposited as a result. Oct 2004. Flood ID 5078
17. Kilnagleary Road flood study – flood issues relating to floodplain which the proposed link road will traverse. Flood ID 1575
18. Ballybrack Stream flooding, Douglas, Co Cork 20/27/11/2002. Pedestrian bridge has been upgraded since those flood dates. Photos show flood debris marks. Flood ID 1363
19. Palmbury Orchard Estate, Togher 20/21/27/11/2002. Surface water drainage is effected through soakaways, heavy rainfall caused localised flooding in estate. Recurring Flood ID 3636
20. Greenwood Estate – flooding caused by stream overflowing at culvert entrance, water flows down Togher road and into estate. Greenwood and Palmbury are located side by side but the flooding is caused by completely separate problems Nov 2000 & Nov 2002. Flood ID 3637 & 1588

CORK COUNTY COUNCIL COMHAIRLE CONTAE CHORCAI



Report on Flooding Event of 28th June 2012

9th. July 2012

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1 INTRODUCTION

Cork County experienced localised extreme rainfall events in various locations in the county during the early hours of Thursday 28th June 2012. These rainfall event described by Met Eireann as a 'Convective Storm' swept across Ireland. This caused widespread damage throughout the county and has left a number of communities devastated particularly Clonakilty Douglas and Glanmire. It is estimated that in excess of 50mm of rainfall fell in a period of three hours. Cork County Council activated it's flood response plan at 4.09am on the 28th.

In summary the areas worst affected were Clonakilty town and the City environs, North and South and Glanmire. Severe damage was caused to private houses and to commercial properties in Clonakilty, Douglas, Glanmire and in other areas.

The Council's flooding response commenced in these areas very early in the morning and involved local rescue, in the first instance, by emergency crews aided by Civil Defence and Council area crews. As events progressed assistance was provided to property owners, in pumping out and general clean up together with cleaning and draining the public areas. Arrangements were made to accept waste from damaged properties and recording of flood levels and other data collection commenced.

Cork County Council staff, Cork City Council Staff, Emergency Partners and the local communities worked together tirelessly throughout the event in difficult conditions. The days following the flood event have also been difficult during the clean-up, in particular for the residents and communities' worst effected. Cork County Council wishes to acknowledge and thank all those involved during this event.

At present Cork County Council is assembling detailed reports from our staff on the ground and data such as rainfall records, etc. to establish a complete picture of the event and its consequences countywide.

A striking feature of all three worst affected catchments, Clonakilty, Douglas and Glanmire, was the short and steep nature of these catchments. This combined with the already saturated ground conditions and the intensity of the rainfall was a major contributory factor to the flooding. It should be noted that all of the major rivers in County Cork, the Blackwater, Lee, Bandon and Ilen did not flood.

At approx. 11.00am on Thursday 28th following on from the Crisis Management Team meeting at 7.00am the County Mayor, County Manager, the Divisional Manager of South Cork and the County Engineer visited the worst affected areas of Douglas, Glanmire and Clonakilty to view for themselves the scale of damage and show their appreciation of the great work undertaken by the communities and emergency services in the aftermath of this devastating event.

This report outlines the flooding event in the County with the initial response Cork County Council carried out.

2 WEATHER WARNINGS

On Wednesday 27th June 2012 Met Eireann issued the following weather warnings.

First rainfall warning issued by email at 5.00pm. Followed by a second rainfall warning at 5.56pm. It has been confirmed by Met Eireann that these warnings were sent out to all of the Munster and South Leinster region.

Met Eireann have also confirmed that the rainfall amounts up to the 28th June were **3 times** more than the average rainfall for the month. Also it is worth noting that Met Eireann had issued 3No. weather warning alerts in June prior to Wednesday 27th June, as follows;

Date	MET EIREANN ADVISORY
06/06/2012	40 to 60mm of rain expected in Munster and Connacht on Thursday 7 th Jun. Risk of further 20 to 30mm on Friday 8 th Jun.
13/06/2012	Preliminary Weather Warning. Heavy rainfall of 40mm or more expected in period 14.6.12 to 15.6.12 further updates to follow.
14/06/2012	Persistent rain this eve and Fri, further accumulations of 25 to 35mm over 36hrs. Up to 45mm possible on mountains.

It must be stressed that none of these rainfall warnings caused significant flooding events within the county.

Weather warnings issued on 27th were as follows:

Date	MET EIREANN ADVISORY
27/6/2012 at 17:00	Heavy rain will develop overnight and there will be some torrential and possibly thundery downpours. These falls may lead to localised flooding. Rainfall totals of 30 to 50 mm are likely but due to the thundery nature of the rain localised totals of up to 70mm are possible. Valid from 23:00 hours Wednesday, 27-Jun-2012 until 12:00 hours Thursday, 28-Jun-2012.
27/6/2012 at 17:56	Heavy rain will develop overnight and there will be some torrential and possibly thundery downpours. These falls may lead to localised flooding. Rainfall totals of 30 to 50 mm are likely but due to the thundery nature of the rain localised totals of up to 70mm are possible. Valid from 18:00 hours Wednesday, 27-Jun-2012 until 12:00 hours Thursday, 28-Jun-2012

As per Cork County Council's standard procedures, these warnings were distributed to the appropriate staff within the Local Authority.

From late on Wednesday night (27th) onwards parts of County Cork experienced very heavy rainfall. This rainfall was locally intense over a short time period. This can be seen from the records available from the following locations:

1. Blackwater Flood Warning System

Mallow: 30.4mm of the 44mm daily total fell in the 2 hour period starting at 23:15 on the 27th.
Mitchelstown: 24mm of the 34mm daily total fell in the 2 hour period starting at 00:30 on the 28th.

2. Bandon Flood Early Warning System

The Bandon FEWS rain gauge is located at Dunmanway Waterworks and recorded the following:

Date	Time	4 hourly totals (mm)
27/06/2012	Midnight-4.00am	0.2
	4.00am-8.00am	0.2
	8.00am-12.00pm	0.2
	12.00pm-4pm	0
	4.00pm-8.00pm	1.2
	8.00pm-Midnight	35.4
28/06/2012	Midnight-4.00am	4.2
	4.00am-8.00am	0.8
	8.00am-12.00pm	0.6
	12.00pm-4pm	1.4
	4.00pm-8.00pm	3.4
	8.00pm-Midnight	8

As can be seen from the examples above the intensity of the rain event varied dramatically over these locations.

Met Eireann have described the weather event as a 'Convective Storm' that swept across Ireland. They have noted that with this type of storm it is very difficult to predict where the rainfall will occur.

Cork County Council has commenced gathering recorded rainfall data from a number of sources through out the county and this process is ongoing.

Using the information gathered to date, a graphical representation of the daily (24hour) rainfall totals for Thursday 28th is as follows:

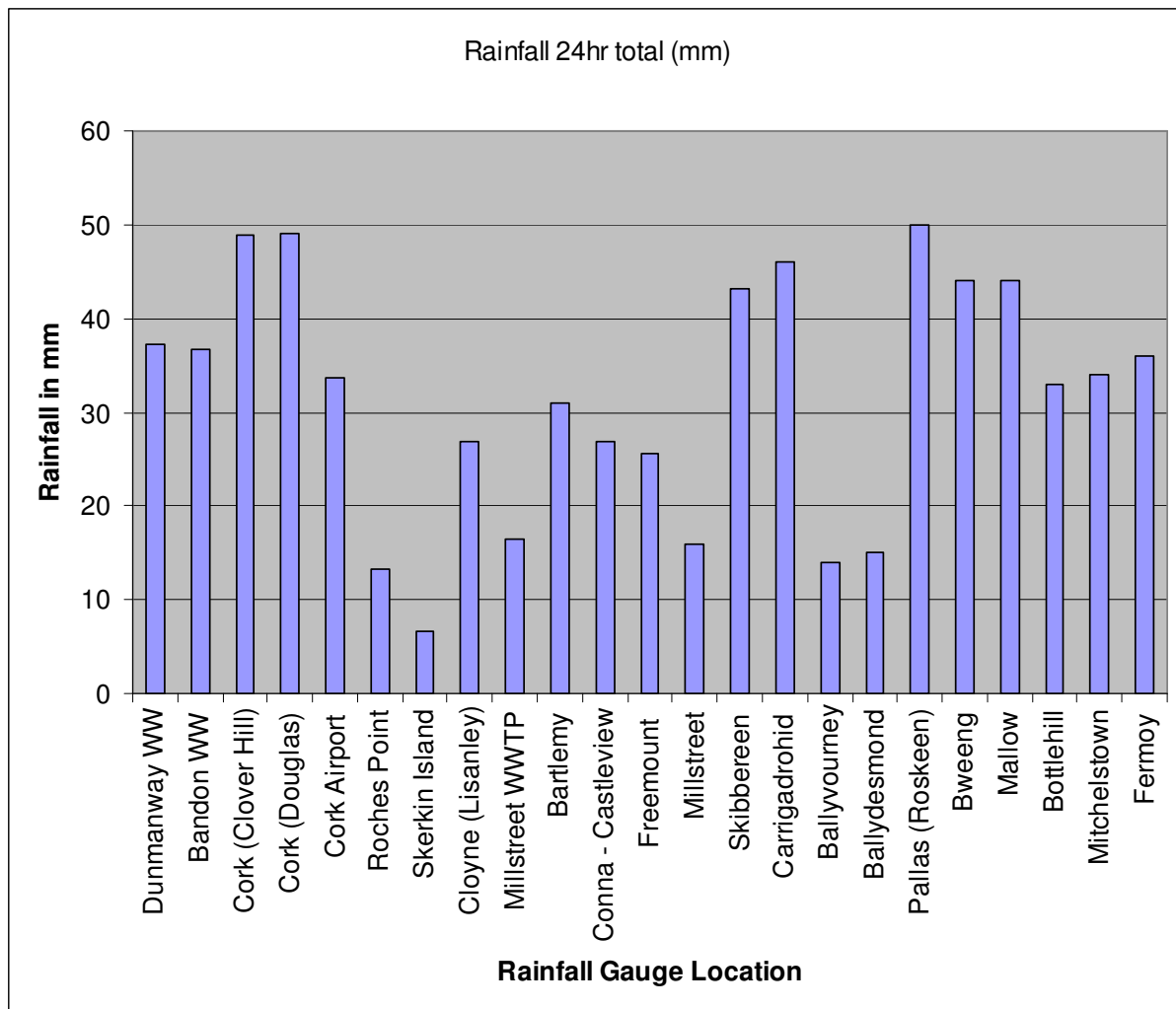


FIGURE 1 – RAINFALL 28/6/2012

This shows quite clearly that rainfall amounts varied throughout the county on the day in question.

Met Eireann has stated that June 2012 has been wettest June on record, with 3 times the average rainfall falling. This may have had an influence on the events of 28th June, as soil saturation before a rainfall event may have contributed to the severity of the flood. As soil becomes saturated it does not have the capacity to absorb additional rainfall, therefore under these conditions, essentially all of the rain that falls, whether on paved surfaces or on saturated soil, runs off into the watercourse.

To give an indication of the June 2012 rainfall in the Cork region, the following chart shows the daily totals for the rain gauges at Dunmanway, Cork Airport and at Roches Point:

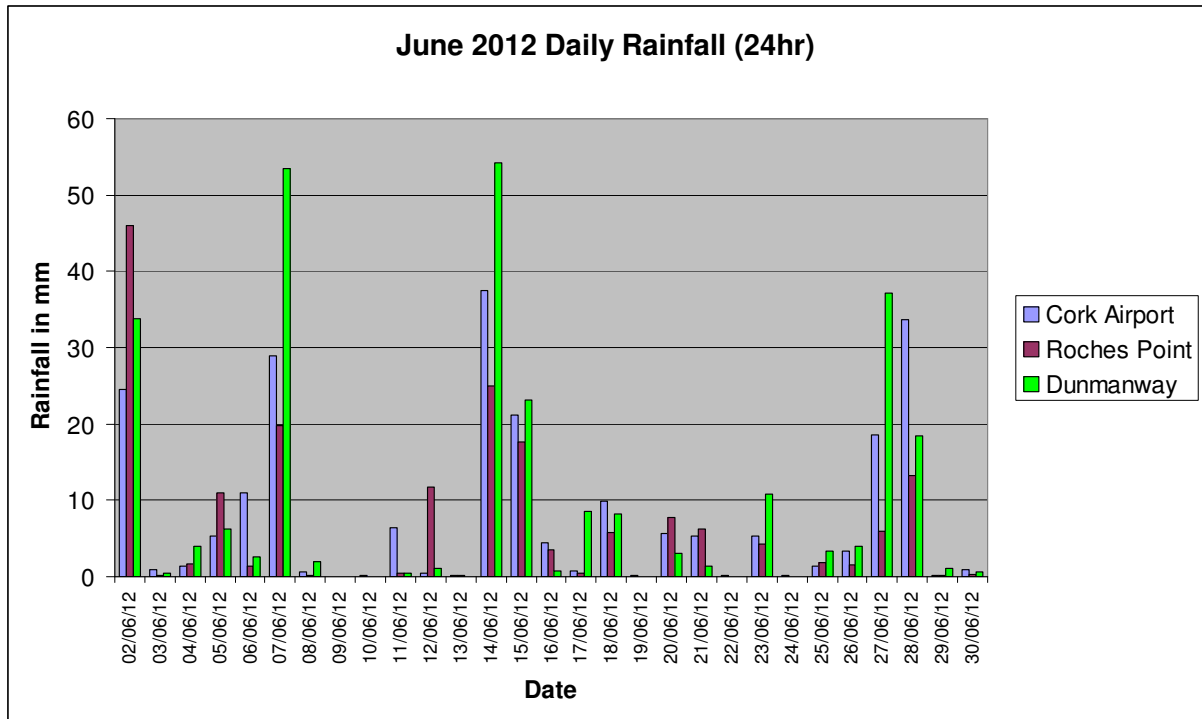


FIGURE 2 – RAINFALL CORK REGION JUNE 2012

As noted above the higher rainfall events earlier in the month did not cause significant flooding.

3 CHRONOLOGY OF EMERGENCY RESPONSE / ACTIONS TAKEN

As noted in the previous section Met Éireann issued two separate weather warnings on 27th June, 2012. Engineers in each Division monitor Met Éireann weather forecasts and severe weather warnings. On receipt of information which indicates the possibility of flooding it is standard practice as part of the assessment of potential flood risks for personnel within the Area's to take steps to check known trouble spots. Notwithstanding the limitations associated with the widespread nature of the severe weather warnings issued by Met Éireann on 27th June, normal precautions were taken and known trouble spots were checked.

In the event of major flooding there are a number of different elements to the overall emergency response which include:

1. The operational response on the ground
2. Rescue operations
3. Providing assistance to displaced persons
4. Dealing with the media
5. Clean-up & Recovery operations

The emergency response to major flooding, as is the case in other major incidents, demands a coordinated approach combining the expertise and resources of several agencies. In this regard the emergency response to the severe weather events of 28th June necessitated the assistance and support of various sections within Cork County Council, Cork City Council, An Garda Síochána, the Health Services Executive, Port of Cork, ESB, OPW, Community and other Voluntary Services including Civil Defence and Red Cross. Additional support was also provided during the recovery phase by the Department of Social Protection, and the Department of Environment, Community and Local Government.

The table below sets out, in broad terms, a timeline of actions taken by Cork County Council in response to events of 28th June. This timeline is not intended to be a complete log of every single action taken in response to the many different flood related incidents throughout the county but should help to frame how this incident developed. The speed at which this incident unfolded can clearly be seen from this log of events.

The speed at which this incident developed certainly influenced the level of inter-agency response required. Furthermore, given the nature of the event it was determined at an early stage that officials from each of the partner emergency response agencies should remain in regular phone contact with each other throughout the incident and to keep under review the need to convene an inter-agency meeting.

At 03.45 the CFO was informed by the Divisional Manager South that he had taken the decision to convene Cork County Council's own Crisis Management Team in County Hall at 07.00hrs with a view to managing and coordinating Cork County Council's overall response to the emergency and recovery operations and requested that the appropriate alert messages be issued.

The following are some of the functions which were taken on by the Crisis Management Team:

1. As many of the affected areas were adjacent to the City boundary, with several areas within the City also being affected, it was decided to establish a joint emergency

- contact number with Cork City Council (021-4208000). A total of 113 calls were received on the joint emergency contact number.
2. The Mayor, County Manager, Divisional Manager South, the County Engineer and Director of Services West visited the affected areas to witness at first hand the extent of the damage caused by the flooding and to acknowledge the efforts of all those from the various agencies, with particular reference to members of the local communities and other voluntary services, who were involved in emergency response and recovery efforts.
 3. Welfare centres were established at the Quality Hotel in Clonakilty and the Community Hall in Riverstown to assist people who had to evacuate their residences.
 4. In the context of establishing appropriate channels of assistance for affected householders Cork County Council Officials worked in liaison with officials from the Department of Social Protection and with the Community Garda for the Glanmire area.
 5. The supply and quality of water schemes likely to be affected were monitored. A boiled water notice was issued as a precautionary measure to the residents of the Quarry Hall Group Water Scheme in Grenagh.

Time	Details
June 27th 2012	
17.00	Severe Weather Alert received from Met Éireann (Valid from 23.00hrs 27 th June to 12.00hrs 28 th June)
17.00	Weather warning was forwarded automatically by email to all relevant staff. Area Office personnel followed procedures which includes checking known problem spots.
17.56	Severe Weather Alert received from Met Éireann (Valid from 18.00hrs 27 th June to 12.00hrs 28 th June). This was also forwarded to relevant staff
June 28th 2012	
00.30 – 02.30	Multiple calls (34) to the Fire Service Control Centre over a 2-hour period looking for assistance with flooding. Brigade's not mobilised - callers advised that Fire Service will only respond to life-at-risk flood-related incidents.
00.53	District Supervisor was informed of flood related problems at Airport Hill/Kinsale Road roundabout, Kinsale Road/Tramore River and at Harvey Norman/Barry's Tea and at Togher. Council Crews responded to all these areas.
01.27	Cork City Fire Brigade mobilised to a car stuck in floodwaters at Kinsale Road Roundabout
01.38	There was an automatic amber alert for the trash screen in Douglas sent to the General Services Supervisor for the Douglas Area. The District Supervisor was informed and responded.
02.18	Cork City Fire Brigade mobilised to assist a HSE Ambulance with cardiac patient on-board which got stuck in floodwater between Bishopstown and the Viaduct
02.39	Bandon Fire Brigade mobilised to flooding in Bandon
02.40	Divisional Manager received a call from District Supervisor for the Carrigaline/Douglas area informing him of automatic alert activation for the trash screen in Douglas and other emerging flood related problems
02.45	Cork City Fire Brigade mobilised to person trapped in floodwater at Sarsfield Road.
02.49	Divisional Manager contacts CFO

02.51	Divisional Manager contacts ESB
03.04	Kinsale Fire Brigade mobilised to flooding rescue in Kilbrittain
03.05	CFO in contact with Munster Regional Communications Centre (MRCC)
03.12	CFO in contact with Cork City Fire Brigade
03.12	Cork City & Midleton Fire Brigade mobilised to Fire in St. Stephen's Hospital, Glanmire
03.16	Fermoy Fire Brigade mobilised to flooding in Kildinan
03.22	Mallow mobilised to flooding rescue in Dublin Pike
03.30	CFO in contact with Togher Garda Station
03.32	Clonakilty & Dunmanway Fire Brigade mobilised to flooding in Clonakilty
03.36	CFO in contact with Chief Emergency Management Officer, HSE
03.45	Decision was taken to convene Crisis Management (CMT) in County Hall at 07.00hrs.
03.59	Divisional Manager contacted County Manager
04.00	Press Release (96FM and RTE) and DECLG was advised of events
04.09	Text alert notification to Management Team – Flood Emergency Response Plan activation. CMT to convene at 07.00hrs in County Hall.
04.17	Cork City Fire Brigade mobilised to flooding in Togher
04.25	Notification of activation of Cork County Council Flood Emergency Response Plan given by MRCC (Fire Control) to An Garda Síochána (Anglesea St., Bandon & Fermoy Garda Stations), HSE Ambulance Control, Department of Environment, Community & Local Government
04.40	ESB contacted. No further update available from ESB.
04.59	Mallow Fire Brigade mobilised to flooding on Commons Road, Blackpool
05.18	Fermoy Fire Brigade mobilised to flooding in Rathcormack
05.31	Cork City Fire Brigade mobilised to Meadowbrook
06.54	Cork City Fire Brigade mobilised to flooding in Douglas (Tesco)
07.00	MRCC received 118 flood related calls for Cork County Fire Service between midnight and 07.00hrs, 34 incidents mobilised
07.00	Crisis Management Team convene in County Hall
07.25	Civil Defence requested to Clonakilty
- 08.00	74 no. of calls received by VoxPro
08.45	Department of Environment, Community & Local Government updated on Recognised Current Situation & Key Issues. Informed that National Co-ordination Group are convening at 09.30 in Kildare St.
08.59	Press release
09.15	Civil Defence requested to Meadowbrook, Glanmire
09.30 – 09.45	Call Centre is set up and goes into operation. Joint Emergency Contact Number in use for Cork County Council and Cork City Council.
10.00 - 11.45	The Mayor, Manager, Divisional Manager South, the County Engineer and Director of Services West depart to visit affected areas. Representatives from Roads, Water, Fire & Media Liaison remain in place to deal with evolving issues.
11.45	MRCC received an additional 7 flood related calls between the hours of 07.00 and 11.45, 4 incidents mobilised
11.45	CMT reconvenes to provide updates on the situation.

12.30	Press Release
17.30	Press Release
Verify - AB	Press Release posted on Cork County Council website
	Posted tweets on Twitter from 11.45am., 29 th .
09.00 – 22.00	A total of 113 calls are received on joint emergency contact number with City Council - (021) 4208 000
	An account of recovery operations is included in the section of this report dealing with Major Local Impacts

4 MAJOR LOCAL IMPACTS

4.1 Clonakilty

4.1.1 Clonakilty Town

On the 27th June 2012 a high neap tide (not exceptionally high) occurred at 11.45pm. Pluvial (rainfall) flooding had already occurred in the Casement Street area of the town prior to any fluvial (river) flooding. Cork County Council staff received a report of flooding in Casement Street at 12.30am. A crew was mobilised at 1.00am to deal with the pluvial flooding. Crew consisted of 5 staff, 2 JCB, 1 6T Dumper and 1 loadall. It was noted at 1.00am approx. that the river was within a foot of the top of Kent St. Bridge arch.

At 2.20am a large volume of flood water was reported to have come from a tributary of the Fealge River to the west of the town (near Pat Joe Donovans Garage). The tributary burst its banks, flooded two houses and flowed down the road to the junction (Maxol Station / Dunnes Stores) where the River Fealge then burst its banks, knocking a block wall. Flood waters flowed down the main streets through the town (Michael Collins Road / Oliver Plunkett Street / Pearse Street / Ashe Street / Wolfe Tone Street were flooded). Areas to the south of these streets are at a lower level and flood waters flowed into these areas. The river which flows through these low lying areas, then burst its banks at 3.20am along Kent Street and Rossa Street where severe flooding occurred.

The entire town was flooded by 4.00am. At 8.00am. the river was still running full. Clonakilty Bypass reopened at 12.00pm approx .

The flood event experienced on 28th June in Clonakilty town is regarded locally as being far worse than the November 2009 event. Most of the town centre was under water, a riverbank wall collapsed at the Kent Street car park and further collapses were noted on the existing river wall at Kent Street in the immediate aftermath.

During the event and subsequent clean-up Clonakilty's community spirit was to the fore, with assistance from Clonakilty Town Council Staff, Cork County Council staff from throughout the West Cork area, Emergency Services, Civil Defence volunteers, Local Traders and residents all worked tirelessly to remedy the situation. This work was coordinated by the Gardai and Town Council Staff.

A large number of properties were flooded. Initial estimates as follows:

- 70+ Houses.
- 100+ Commercial/public, including the Fire Station, Clonakilty Library and the Town Hall.

The existing riverbank walls collapsed at a number of locations, in particular at Kent Street Car park and on Kent Street itself opposite Post Office. In response to these significant collapses, an initial condition survey was carried out by RPS Structural Engineers on Friday 29th. This formed a basis of a submission for funding to the OPW.

4.1.2 Clonakilty - Rural

A number of areas suffered severe flooding causing widespread infrastructural and property damage. To date, noted property flooding locations include:

- Ballinascarty Village: 18 properties flooded.
- Rathbarry Village: Many properties flooded.

Many roads were severely damaged and structural damage was caused to a number of bridge and culverts. Locations include Ardfield, Rathbarry, Rosscarbery, Clonakilty, Ballinascarty and Red Strand.

An initial estimate of serious damage:

- 36 roads
- 16 bridges/culverts, with 4 bridges impassable.
- 9 roads were closed in the town.

4.2 Douglas

Extremely heavy rainfall and steep catchment area gave rise to flooding of the Ballybrack Stream to the south of Douglas Village.

The Ballybrack trash screen, which is located in Douglas Community Park, was inspected prior to this event routinely at 8.30am and at 4.15pm on 27th June by Cork County Council staff and the screen was found to be clear.

The Ballybrack trash screen alarm system activated at 1.38am. Approximately 10 minutes later a Cork County Council staff member was on site to inspect the screen and noted minor debris present at the screen. A very heavy thunder shower was occurring at this time and telephone lines were out of commission.. The Council employee then went to check on Daly's Corner, Grange Hill and the southern end of Douglas. Thunder and lightening resulted in a power cut which left the village in darkness. On his return 20 minutes later, he could not access the screen as conditions were too dangerous with water overtopping the screen. It should also be noted that flood related problems were also occurring at locations including Airport Hill/Kinsale Road roundabout, Kinsale Road/Tramore River and at Harvey Norman/Barry's Tea and at Togher. Council crews were also responding in these areas.

Between 1.00am and 2.00am the Ballybrack Stream burst its banks upstream of Douglas village at the blocked trash screen located 500m further upstream from the Ballybrack trash screen. The water entered two residential properties, knocked a block wall, entered a meeting hall and knocked a second block wall.

Church Road is at the southern entrance of Douglas Community Park (towards Dalys Cross). Church Street is at the northern entrance to Douglas Community Park (opposite Tesco).

Flood waters then flowed onto Church Road and through Douglas Community Park, Church Lane and West Douglas Street from the upper trash screen.

The Ballybrack Stream is culverted from the edge of Douglas Community Park (opposite Tesco) and under the Shopping Centre, where it then joins the Tramore River.

The Ballybrack trash screen became blocked due to the volume of debris being conveyed in the stream as a result of the extreme rainfall event.

Properties were flooded on Church Street. Flood waters travelled east along Church St. to West Douglas Street and also water flowed in an easterly direction to East Douglas Street. Some flood waters entered the Tramore River at the bridge on West Douglas Street and flowed in through the Douglas Woollen Mills area.

Reports of very high volume storm water runoff from Grange Road may also have contributed to the flooding. Up to three feet depth of water was reported in many locations.

A number of properties were flooded including:

- 12 Houses
- 100 Commercial properties.
- 2 Community premises (Hall / Medical Centre).

The flood waters began to recede at approx 3.00am and were cleared by approx 9.00am. Clean-up activities began at 7.00am on Thursday 28th and continued throughout that day and the following days. Community spirit was again ever present with the cooperation of the entire community.

4.3 Glanmire

Cork County Council staff received a call that there was flooding at Meadowbrook Estate at 4.42am on 28th June. Staff were already out working, responding to other flooding emergency calls since 3.11am in other locations in the Glanmire Area.

Cork County Council staff arrived at Meadowbrook Estate at around 07.30 am, where Gardai and the Fire Service were already present.

The Glashaboy River which runs alongside the Meadowbrook Estate overflowed flooding the roads and most of the houses in the estate in some areas to a depth of four feet. The Hazelwood Shopping Centre situated slightly upstream had also been flooded to a similar depth.

Further Cork County Council staff arrived at the Meadowbrook Estate between 8.15am and 9.00am. The flood level was dropping slightly in the estate at this time.

At 9.00 am approx it was noted that the water level in the Glashaboy River had fallen significantly. Two surface water pumps were deployed by Council staff to drain the flooded areas back into the Glashaboy River. Water levels began to drop immediately and by early afternoon the floodwater was largely gone, leaving huge quantities of debris and mud to be cleaned up.

Screens, gullies and inlets were blocked by debris caused by the intense rainfall event. Council staff, trucks, a suction cleaner and a J.C.B. worked to open inlets and remove debris from the general Meadowbrook, Hazelwood and Riverstown Cross and Glanmire Village Areas throughout the event.

It should be noted that gullies and drains are cleaned on a routine basis throughout the year as part of our maintenance programmes.

Flood waters flowed through Sallybrook, Hazelwood Cross, Hazelwood Shopping Centre, Meadowbrook Estate, Riverstown Park and the Rierstown Cross to Glanmire Bridge road. Eventually all flood water ended up back in the Glashaboy River. Some sewers/combined sewers backed up and overflowed.

In summary:

- 45 (approx.) houses were flooded in Meadowbrook Estate.
- 10 commercial units were flooded in the Hazelwood Shopping Centre, including the Council's Library.

Some road surface damage and potholing occurred on roads in the general Riverstown/ Glanmire Area.

By early afternoon 28th June most floods had subsided. The clean up began in the area at approximately 8.30am on 28th June.

One of the striking elements of this event was the coming together of all strands of the community to help those in difficulty. Glanmire Community Hall was open throughout the day dispensing tea, coffee and food to all, which was provided free of charge by the traders. As previously noted in the other areas the same level of cooperation existed with the Local Authority, Emergency Services, etc. Cork County Council wishes to thank Cork City Fire Brigade and Civil Defence Volunteers who gave invaluable assistance during the day.

4.4 Countywide

Many other incidents of flood damages have been recorded in areas throughout the county including Skibbereen, Bandon, Dunmanway, Crookstown, Mallow, Mitchelstown, Carrigaline and Midleton.

Due to the large amount of damage encountered in the county, Cork County Council local staff have been addressing the immediate needs of the community and collating reports on all of the affected areas. These reports are now being reviewed.

5 COMMUNICATIONS

5.1 Weather Information.

Cork County Council has standard protocols in place with Met Eireann for the receipt of reports and weather warnings. Met Eireann prepares sixteen reports covering the different areas of County Cork and these are sent to a predetermined list of senior and technical staff daily. In addition to these standard reports, weather warnings are sent by Email to a similar list of staff when they arise. These warnings are not area specific. Met Eireann issued rainfall warnings on five occasions during June 2012, as detailed in Section 2 of this report.

5.2 Emergency Contact Arrangements

Cork County Council website carries details of Out of Hours contact details for emergencies. Emergency Services calls are routed to the Munster Regional Control Centre(MRCC), which serves the Fire Authorities of the Munster region on a 24 hour basis and deals with each call in accordance with pre defined arrangements (PDAs). Where an incident reported is not life threatening, the call details are forwarded to the local authority's contact centre, which generally operates during standard office opening hours. After hours contact numbers are dealt with by an offsite contact centre and referred to on-call staff if the situation warrants. In the case of flood response, the Emergency response procedure provides for the on-call staff to make contact with senior staff that may then activate the Flood Emergency Response Plan as was done on this occasion. MRCC received 113 calls between midnight and 0700 hours, resulting in 34 brigade mobilisations.

5.3 Dedicated Flood Emergency phone number

The Crisis Management Team, in agreement with the Cork City Manager, set up a joint County/City service for the receipt of calls and reports from the public throughout the day of June 28th. Operated from the Cork County Council Contact Centre at County Hall, this service continued through until 10pm, staffed by the Local Authorities. Thereafter calls were diverted to the regular out of hours services until 9am on the morning of June 29th. The service received a total of 113 calls during the day of June 29th, recording details for examination and response by the crisis management team.

5.4 Media Releases – Email

Copies of the Council's press releases of June 28th are attached in appendix 1 to this report.

5.5 Media Spokespersons

The County Manager was interviewed on RTE Radio 1's Morning Ireland programme at 08.00hours and again later by RTE Television's Paschal Sheehy. The Divisional Manager (North) was interviewed on RTE's News at One. The County Engineer was interviewed on Today FM at 4.30pm.

5.6 Website and Social Media outlets

The Council utilised both the website and social media systems to disseminate essential information to the public.

6 POST EVENT ACTIONS

The immediate post event priorities were:

- To provide assistance to those directly impacted by the floods
- To identify and address the critical works required to damaged infrastructure including flood defences.
- To review the events of the 28th of June in order to identify additional actions that may be appropriate.

Due to the nature and severity of the flooding event many areas require remedial action. It must be noted that the worst affected areas are, as previously stated, Clonakilty, Douglas and Glanmire.

Submissions for funding have been submitted to the Office of Public Works for immediate works in the Clonakilty area totalling €1.2million. Additionally funding has been sought for studies of the Ballybrack (Douglas) and Glashaboy (Glanmire) catchments.

Cork County Council has commissioned RPS Consulting Engineers to carry out a detailed report on the Ballybrack (Douglas) catchment in light of the events of Thursday 28th June 2012 and this work commenced on Tuesday 3rd July. The Glashaboy (Glanmire) study is to follow.

A submission relating to roads damage throughout the county has been made to the Department of Transport in the amount of €7.4million. A further submission will follow to the National Roads Authority outlining the damaged to national roads in the county.

A submission has also been made to the Department of the Environment, Community and Local Government for reimbursement of costs associated with damage to Water Services infrastructure, libraries, public realm and emergency staff costs, in the amount of €1.4million.

At the request of Cork County Council, the Office of Public Works mobilised their South-West CFRAMS Consultants, Mott MacDonald, to record all available flood data for inclusion in their study. This commenced on Thursday 28th June.

Immediate Emergency Works – Clonakilty

On Thursday morning 5th July reports of possible damage to Rossa Street Bridge. RPS Structural Engineers were immediately deployed to investigate. Very significant structural damage was noted. Immediate structural stabilisation works are currently being undertaken.

7 ASSISTANCE TO PROPERTY OWNERS AND HOUSEHOLDERS

During the events of the 28th June, Council staff and emergency services provided ongoing assistance to communities affected by the floods. Voluntary and community groups played an exceptional role in assisting and supporting those affected.

Cork County Council opened its Civic Amenity Sites at Clonakilty, Bandon, Rossmore and Rafeen to accept flood damaged materials free of charge. Skips were also provided free of charge in the worst affected areas of Clonakilty, Douglas and Glanmire and were removed and replaced on an ongoing basis as required.

In response to questions in the Dail on Wednesday, July 4th, the Minister for Environment, Community and Local Government, Deputy Phil Hogan, stated that following a full evaluation of the available reports, he would decide on a level of support for Local Authorities in relation to response and damage costs locally incurred. He further stated that he expected the Department of Social Protection (DSP) would be receiving additional funds in order to provide help to individuals affected. He confirmed that assistance was already being provided on the ground through local community welfare officers.

The Council made contact with the DSP in Sligo on Friday afternoon last and they confirmed that local assistance in response to basic needs was being provided. They advised that, as of that time, no decision had been taken in relation to the establishment of a fund to assist householders. They further confirmed that they did not envisage that funds would be available from DSP to assist business or commercial property owners.

Following a flood event in November 2011, a Humanitarian Assistance Fund was established to assist householder victims of flood in Dublin. It was administered by DSP and Dublin Local Authorities were not involved at that time. A similar fund was established earlier following floods in Galway.

The Evening Echo of Friday, July 6th, contained a report on a specially convened meeting of Douglas Business Association which took place on the evening of Thursday July 5th. It reported that the Minister for Agriculture, Food and the Marine, Deputy Simon Coveney, had confirmed that a special fund would be established to help businesses which were hit by the flood.

8 CONCLUSION

8.1 The unique nature of the weather event.

The weather warning issued on the 27th June was not specific.

Previous high rainfall warnings issued in the month of June did not result in significant flooding.

Significant flooding impacts did not occur in the major rivers of the county, i.e. the Blackwater, Bandon and Ilen rivers.

Early warning systems which are in place on the Blackwater and Bandon rivers functioned correctly.

The flood events across the County arose through a combination of unique events at a number of locations which resulted in devastating damage to homes and business.

8.2 Flood Action Plan and Response

The chronology of events and the response by Council staff and emergency services were effective and exceptional having regard to the range of events that required coordination and response.

Communications were effective and in accordance with the Flood Action Plan and responded to events as they developed.

Voluntary and community group responses were exceptional and critical to ensuring those affected were supported.

8.3 Recovery and ongoing action

Critical infrastructure including flood defences need to be addressed urgently in advance of any future weather events. Preliminary submissions have been made to appropriate Government departments.

Necessary works are being advanced on a priority basis pending confirmation of funding from Government.

Flood defence works are being prioritised with the OPW in the case of Clonakilty Town.

Special assistance funds are being provided through appropriate Government Departments.

Web based and SMS supported weather alert systems will be developed in response to demands arising from the events of the 28th July.

8.4 Thanks and Acknowledgement

The events of the 28th July were devastating for many individuals, families and businesses across the County.

I would like to acknowledge and thank all those who worked tirelessly throughout the event to assist and support those affected.

Community groups and volunteers played a critical role and their commitment is acknowledged and appreciated.

Equally, staff of both town and County Councils showed exceptional commitment in the face of very challenging conditions. Emergency services and civil defence were called on throughout the event and thankfully there was no loss of life or serious injury sustained.

APPENDIX 1 – PRESS RELEASES

The following media release issued at **0859 hours, June 28th**:

8.15am 28/6/12

Weather Event 28/6/12

Press Release

Following very heavy rainfall in county Cork early this morning, serious flooding has occurred in a number of areas throughout the county.

The main locations affected were on the Southern and Northern environs of Cork city and in Clonakilty town. However, flooding has extended over many other areas as well.

Cork County Council has been interacting with the GARDAI and the HSE to coordinate the response. The Council initiated its flooding response plan at 4 am this morning. Council fire and roads staff attended at the flooding sites from 2.00 am. Road crews have been on site since first light cleaning blockages. The Council's Crisis Management Team met at 7.00 am and continues to coordinate the response effort.

MET Eireann issued a warning at 5pm on June 27th. Of heavy rainfall expected. In response, Council crews undertook checks at key flooding locations in order to ensure proper drainage. The rainfall has now abated and water levels are dropping. MET Eireann have advised that 50 mm of rainfall fell over a 3 to 4 hours period overnight. Rainfall so far in June has been over three times the monthly average for June.

Roads remain impassable in a number of areas including Clonakilty town, Douglas and Sarsfield's Road. The Council is currently undertaking a review of all water services facilities to ensure continued service.

Emergency contact number 021 4208000

The following media release issued at **1230 hours, June 28th**:

PRESS RELEASE FROM CORK COUNTY COUNCIL RE FLOODING

Heavy flash flooding which arose in Cork County was as a result of 50mm of rain falling over a three to four hour period combined with three times the average rainfall in the wettest month in June on record. The main locations affected were Douglas, Glanmire and Clonakilty Town. However, flooding has extended over many other areas as well.

Cork County Council has been interacting with the GARDAI and the HSE to coordinate the response. The Council initiated its flooding response plan at 4 am this morning. Council fire and roads staff attended at the flooding sites from 2.00 am. Road crews have been on site since first light cleaning blockages. The Council's Crisis Management Team met at 7.00 am where the Flood Emergency Plan was put in place. The Team continues to co-ordinate the response effort.

At present flood waters are receding and the threat of high tide scheduled for Clonakilty at 11.30 has passed. Additional Council Crews will remain in the Clonakilty, Douglas and Glanmire areas late into the night to assist local communities with the clean-up. Douglas is currently at clean up stage while the crews in Glanmire and Clonakilty are continuing to deal with the flooding issue.

Water levels in the Blackwater have peaked and have not reached the danger thresholds, therefore, eliminating the threat of flooding to the Mallow area. The Bandon flood early warning system is presently at a yellow (high) status and is being continually monitored.

Currently fire units from Bandon, Clonakilty and Dunmanway are in Clonakilty while fire units from Middleton and Cork City are dealing with flooding in Glanmire. All units are being assisted by Civil Defence Personnel from both Cork City and County.

A Welfare Centre has been set up at The Quality Hotel, Clonakilty and at The Riverstown Inn, Glanmire to assist people who have had to evacuate their residences.

Main roads throughout the County are passable but diversions remain in some urban areas. Motorists are asked to be careful due to remaining debris or damage to surfaces. Council road crews are continuing to work on the ground throughout the County.

The Council is continually monitoring all wastewater and water service facilities to ensure continued service but at present all are operating as normal. The Council are also in contact with the ESB regarding power issues at Pumping Stations and routing emergency generating equipment.

Cork County Council is arranging for skips to be provided in the Glanmire, Douglas and Clonakilty areas as soon as is practical. For further information the public should contact the following area offices:

Glanmire 021-4821433

Carrigaline 021-4371800

Clonakilty 023-8833347

In addition, flood damaged materials from the public will be accepted at the Raffeen (covering Glanmire area) Rossmore and Clonakilty Amenity Sites free of charge.

A joint Emergency contact number for both Cork City and County Councils has been set

up and members of the public are advised to continue to use this number – 021 4208000

28/06/2012 – 12.30p.m.

Press Contact 086-1706885

Kay Keegan, Cork County Council

Population: Glanmire 8385

Clonakilty 4156

Housing Stats:

Flooded Houses – Clonakilty

40 Houses plus 75 Businesses

Flooded Houses – Glanmire

Meadowbrook Estate 15 – 20 Houses

Treehouse Terrace 3 Houses

Hazelwood Centre – All Units

The following media release issued at **1730 hours, June 28th**

PRESS RELEASE FROM CORK COUNTY COUNCIL RE FLOODING

Cork County Council's Crisis Management Team in conjunction with other agencies are continuing to coordinate the response effort following unprecedented heavy flash flooding which arose in Cork County last night. The situation will continue to be monitored overnight. Fire crews have been on site since first light dealing with the flood issues.

At present flood waters are receding. Additional Council Crews will remain in the Clonakilty, Douglas and Glanmire areas late into the night to assist local communities with the clean-up. Douglas and Clonakilty is currently at clean up stage while the fire crews in Glanmire are continuing to deal with the flooding issue.

Sandbags will be available for collection at area office yards throughout the County and The Lions Club Car Park in Douglas until 10.00 p.m. tonight.

All main roads throughout the County are passable but diversions remain in some urban areas. Motorists are asked to be careful due to remaining debris or damage to surfaces. Council road crews are continuing to work on the ground throughout the County.

Cork County Council is arranging for skips to be provided in the Glanmire, Douglas and Clonakilty areas as soon as is practical.

The following are areas where skips are being dropped:

Douglas (today):

Douglas Community Park

Lions Club Car Park

Greenwood Estate, Togher (across from community centre)

Glanmire (Today)

Outside the Chemist at Hazelwood Shopping Centre

Outside the Library in Glanmire

Tomorrow:

To Meadow Brook, Glanmire

In addition, flood damaged materials from the public will be accepted at the Raffeen (covering Glanmire area) Rossmore and Clonakilty Amenity Sites free of charge.

A joint Emergency contact number for both Cork City and County Councils has been set up and members of the public are advised to continue to use this number – 021 4208000. This number will remain open until 10.00 p.m. tonight. Normal local authority emergency numbers will apply after that.

28/06/2012 – 5.30 p.m.

Press Contact 086-1706885

Kay Keegan, Cork County Council

Flooding at Douglas Village on 28th June 2012

The information contained in this report has been extracted from a Flood Data Collection Form submitted to The Office Of Public Works (OPW) by Consultants carrying out the South Western C.F.R.A.M. Study.

- **Location and date of flood event:**

Location: Douglas Village, Co. Cork.

National Grid Reference:

Irish Grid Co-ordinates – Easting 169,844.00 Northing 69,494.00

This flooding event started on Wednesday 27th.June 2012 at 11.00 p.m., and ended on Thursday 28th.June at 10.00 a.m. The peak flood occurred at approximately 03.00 a.m. on Thursday 28th.June 2012.

- **Source and cause:**

The source of the flood waters was the Donnybrook River (and the cause was fluvial flooding contributed to by pluvial flooding). The flooding occurred in the Togher / Douglas catchment. The Waterbodies were the Donnybrook River and Tramore River.

Extremely heavy rainfall and steep catchment area gave rise to flooding of the Donnybrook River to the south of Douglas Village. The river burst its banks upstream of the village at a blocked bridge, entered 2No. residential properties, knocked a block wall, entered a meeting hall and knocked a second block wall. Flood waters flowed onto the road and through the park. The Donnybrook River is culverted from the edge of the village where there is a trash screen. The trash screen became blocked due to the volume of debris. Flooding reported from entrance to park and at trash screen.

The Donnybrook River is culverted under a shopping centre where it joins the Tramore River, which is tidal and also culverted. High Tide was at approx12.30am, just prior to the peak of the flood.

Reports of very high volume storm water runoff from Donnybrook Hill may also have contributed to the flooding.

- **Flood data:**

The following flood information was provided:

Flood Parameter	Max Value	Typical Value	Comments
Flood Level (metres OD Malin)			
Flood Depth (metres)	1	0.4	
Flood Flow (m ³ /s)			
Flood Velocity (m/s)			

Flooding has occurred at this location before.

- **Impacts of flooding event:**

It was recorded that this flooding event had the following impacts.

Impacts to people: There was no loss of life or no serious injuries.

Impacts to property:

Residential – 12(approx) residential properties were affected by the flooding event, impacting approximately 30 people.

Community – A Medical Centre and a Meeting Hall were affected by the flooding event.

Commercial – Large Shopping Centre - multiple stores incl. Tesco and M&S (approx 60+Units), also, 2 Banks, 29 Retail / Shop units, 4 Public Houses, 4 Fast Food /Restaurants and 1 Petrol Station in the village were affected.

Impacts to transport infrastructure:

Road – 0.4km of West Douglas Street, 0.29km of Church Road, 0.37km of Church yard Lane, 0.27km of Church Street, 0.19km of East Douglas Street and 0.28km of Tramore River Road (New road adjacent to Douglas Village Shopping centre.) were affected by the flooding event.

Impacts to electrical infrastructure: An ESB Sub Station was disrupted for 1 day.

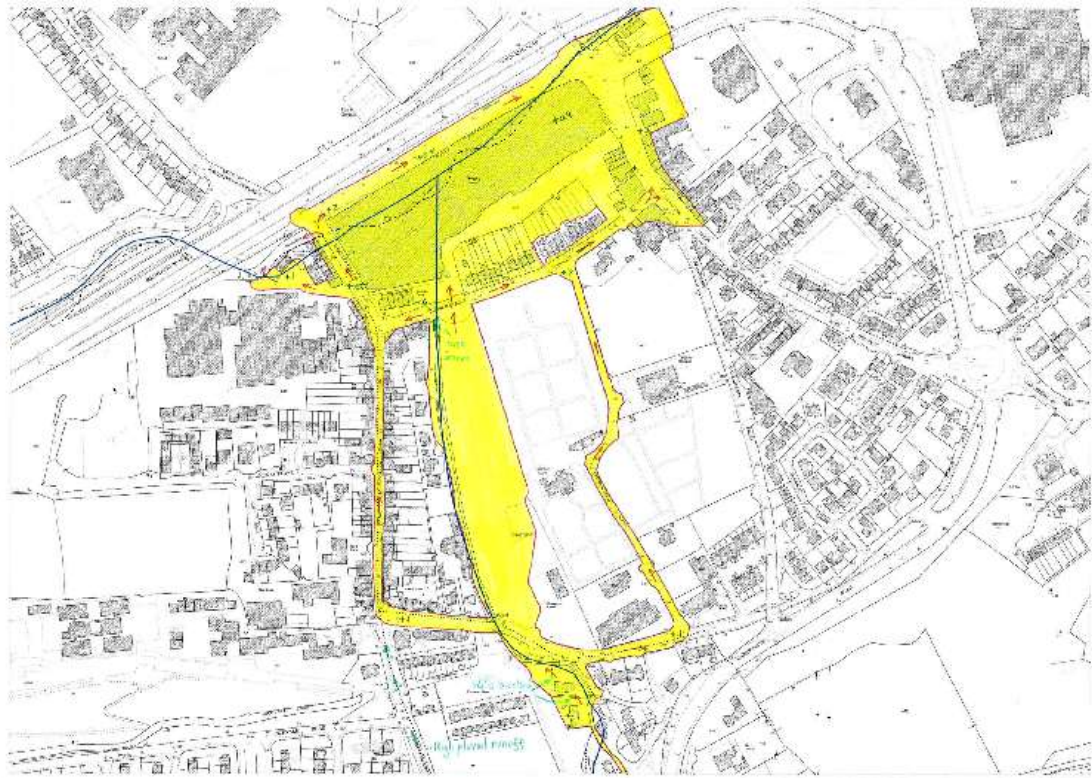
Additional Information:

Map of Location and Extent.

Video Footage : Multiple Videos available online (ie. Youtube)

Attached Photographs.

FLOOD EVENT REPORT
OPW



East Douglas



East Douglas



East Douglas



East Douglas



East Douglas



Church Street



Church Street



Church Street



Church Street - Park



Church Street - Park - Trash Screen



Church Street - Park - Trash Screen



Church Street - Park - Trash Screen



Church Street - Park - Trash Screen



Church Street - Park - Trash Screen



Church Street - Park - Trash Screen



Donnybrook River – in Park – Pipe Crossing



Church Street – Park – Trash Screen



Church Street



West Douglas



West Douglas



West Douglas



East Douglas



East Douglas



East Douglas



East Douglas



East Douglas



East Douglas



East Douglas



Douglas Village Shopping Centre



Douglas Village Shopping Centre



Douglas Village Shopping Centre



Douglas Village Shopping Centre



Douglas Village Shopping Centre

FLOOD EVENT REPORT
OPW



Douglas Village Shopping Centre



East Douglas



Church Road



Church Road



Donnybrook River – Church Road



Donnybrook River – Church Road



Donnybrook River – Church Road



Meeting Hall - Church Road



Meeting Hall - Church Road - Wall Knocked



Meeting Hall - Church Road



Meeting Hall - Church Road



Meeting Hall - Church Road



Meeting Hall - Church Road



Meeting Hall - Church Road - Wall Knocked



Meeting Hall - Church Road



Meeting Hall - Church Road



Residential Property – Behind Meeting Hall – Church Road



Residential Property – Behind Meeting Hall – Church Road – Wall Knocked



Residential Property – Behind Meeting Hall – Church Road – Wall Knocked



Donnybrook River – Church Road



Residential Property – Behind Meeting Hall – Church Road – Bridge Blocked



Donnybrook River – Church Road



Residential Property – Behind Meeting Hall – Church Road – Bridge Blocked



Church Road



Donnybrook River – Church Road



Church Road



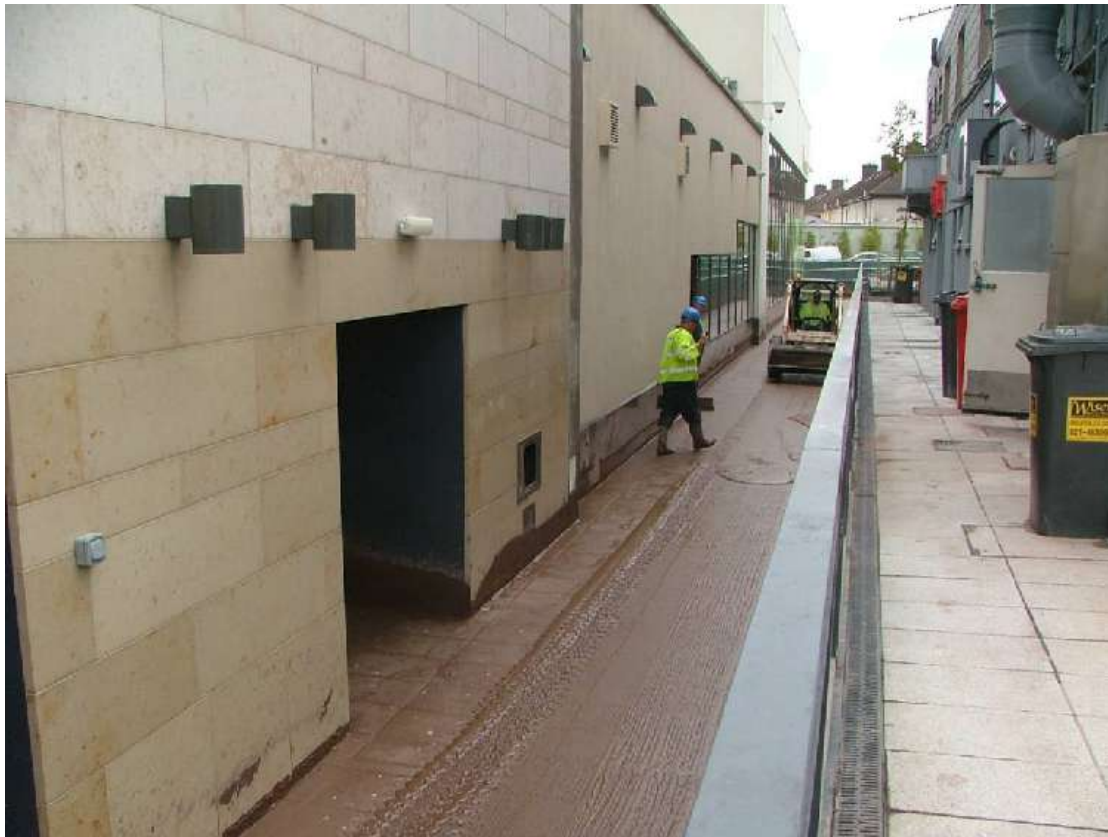
West Douglas



West Douglas



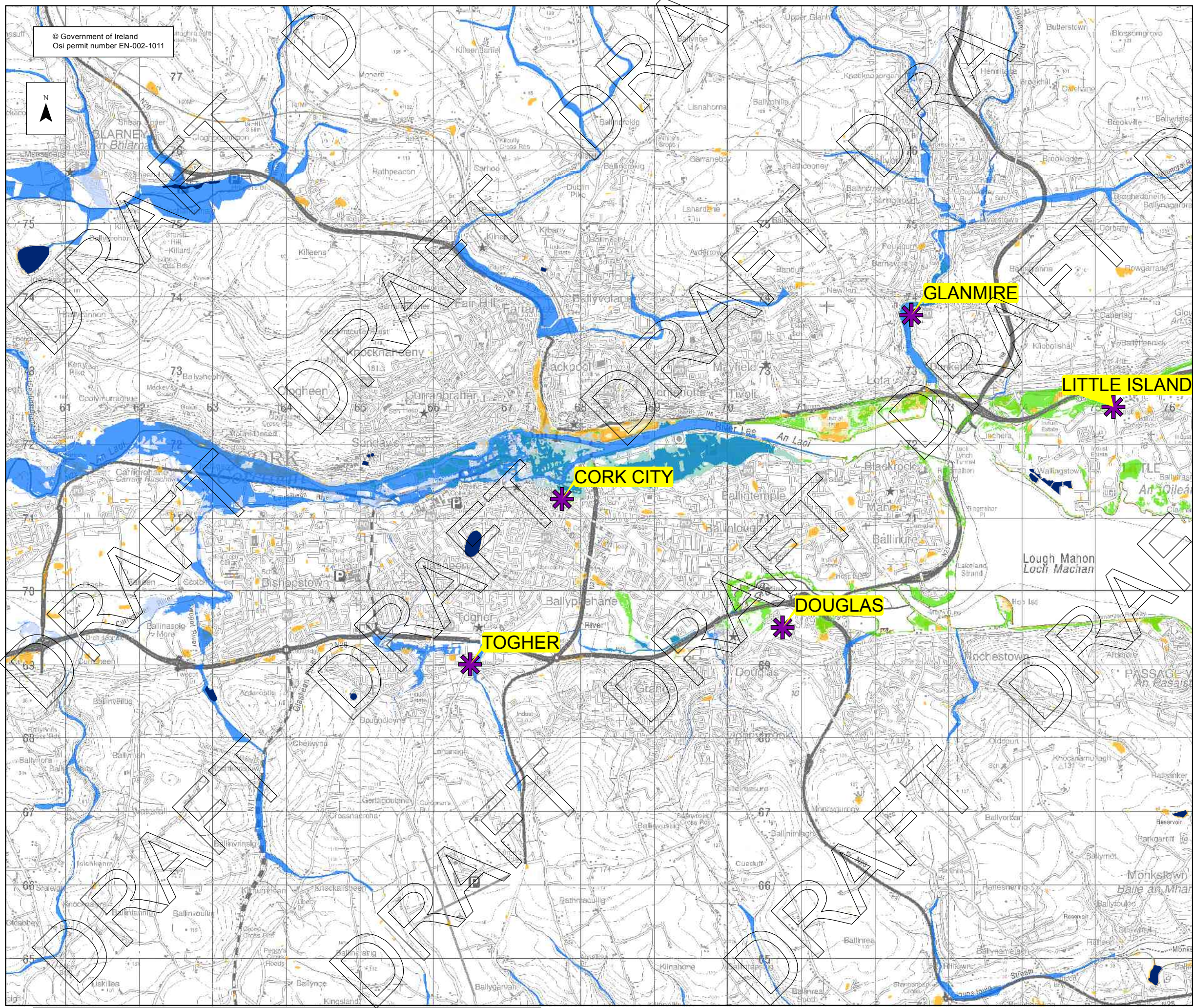
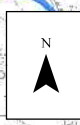
West Douglas – Douglas Village Shopping Centre



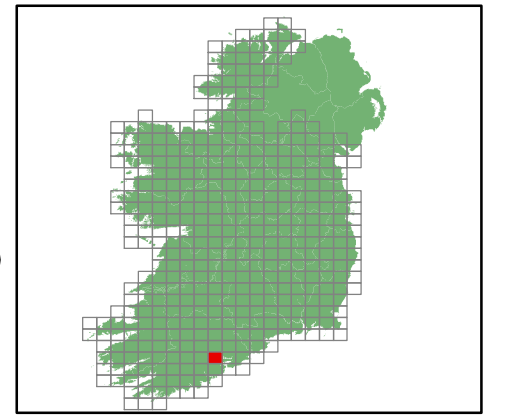
Appendix 2:

PFRA Map

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Osi permit number EN-002-1011



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 Assessment
 - ✱ Possible Area for Further Assessment

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 : July 2011
Checked By : MA Date : July 2011

Figure No. : 2019 / MAP / 38 / A Revision : 0

Drawing Scale : 1:50,000 Plot Scale : 1:1 @ A3

