

Client: **Portal Asset Holdings Ltd.**

Location: **Inch/Coollegrean, Port Road, Killarney, County Kerry**

National Grid Coordinates: **ITM 495909, 591347**

Job: **Site Specific Flood Risk Assessment**

SCOPE OF DOCUMENT

This Site-Specific Flood Risk Assessment, (SSFRA), has been prepared for submission as part of a Large-Scale Residential Development on these lands.

Portal Asset Holdings Ltd is seeking planning permission for the construction of a Large-scale Residential Development (LRD) of 224 no. units comprising 76 no. two storey houses (8 no. 2 bed units, 38 no. 3 bed units and 30 no 4 bed units), 52 no. duplexes over 3 no. storeys and 96 no. apartments in 3 no. 4 no. storey buildings (16 no. 1 bed units and 80 no. 2 bed units), and a 2 storey creche (334 sq. m). Ancillary site works include public and communal open spaces, hard and soft landscaping, pedestrian / cycleways, car parking, cycle parking, bin storage, public lighting, 2 no. ESB substations and all other ancillary works above and below ground. The proposed development includes upgrade works to Port Road, a pedestrian connection to Millwood Estate, and improvements to the stormwater network on St. Margaret's Road, as part of enabling infrastructure for the project.

The SSFRA has been prepared with the view to **assist the Planning Authority in implementing the DOE and OPW Planning and Flood Risk Management guidelines**, referred to as "The Guidelines" throughout this SSFRA, as Planning authorities must implement the Guidelines to ensure that, where relevant, flood risk is a key consideration in preparing development plans and local area plans and in the assessment of planning applications.

It is important to note that compliance with the requirements of the Guidelines and of the Floods Directive 2007 60/EC is a work in progress and is currently based on emerging and incomplete data as well as estimates of the locations and likelihood of flooding. In particular, the assessment and mapping of areas of flood risk generally awaits the full publication the Catchment-based Flood Risk Assessment and Management Plans [CFRAMs]. **As a result, this SSFRA is based on the available information. However, please note the CRFAM Flood Mapping of Killarney is now published, available to the public and referenced in this document.**

FLOOD RISK MANAGEMENT POLICY / BACKGROUND INFORMATION

European Union Floods Directive

European Directive 2007/60/EC on the assessment and management of flood risk aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. The Directive applies to inland waters as well as all coastal waters across the whole territory of the EU. The Directive requires Member States to:

- Have carried out a preliminary assessment by December 2011, in order to identify the river Basins and associated coastal areas where potential significant flood risk exists.
- Prepare flood hazard and risk maps for the identified areas by December 2013.
- Prepare flood risk management plans focused on prevention, protection and preparedness by December 2015. These plans are to include measures to reduce the probability of flooding and its potential consequences.

Implementation of the EU Floods Directive is required to be coordinated with the requirements of the EU Water Framework Directive and the current River Basin Management Plans.

National Flood Policy

Historically, flood risk management focused on land drainage for the benefit of agricultural improvement. With increasing urbanisation, the Arterial Drainage Act, 1945, was amended in 1995 to permit the OPW to implement localised flood relief schemes to provide flood protection for cities, towns and villages.

In line with changing national and international paradigms on how to manage flood risk most effectively and efficiently, a review of national flood policy was undertaken in 2003-2004. The review was undertaken by an Inter-Departmental Review Group, led by the Minister of State at the Department of Finance with special responsibility for the OPW. The Review Group prepared a report that was put to Government, and subsequently approved and published in September 2004 (Report of the Flood Policy Review Group, OPW, 2004).

The scope of the review included a review of the roles and responsibilities of the different bodies with responsibilities for managing flood risk, and to set a new policy for flood risk management in Ireland into the future. The adopted policy was accompanied by many specific recommendations, including:

- Focus on managing flood risk, rather than relying only flood protection measures aimed at reducing flooding
- Taking a catchment-based approach to assess and manage risks within the whole-catchment context
- Being proactive in assessing and managing flood risks, including the preparation of flood maps and flood risk management plans.

National CFRAM Programme

The national Catchment Flood Risk Assessment and Management (CFRAM) programme commenced in Ireland in 2011. The CFRAM Programme is intended to deliver on core components of the National Flood Policy, adopted in 2004, and on the requirements of the EU Floods Directive. The Programme is being implemented through CFRAM studies which are being undertaken for each of the six river basin districts in Ireland.

The Programme comprises three phases as follows:

- The Preliminary Flood Risk Assessment (PFRA) in 2011;
- The CFRAM Studies and parallel activities, from 2011 to 2015; and
- Implementation and Review from 2016 onwards.

The Programme also provides for three main consultative stages as follows:

- PFRAs in 2011;
- Flood Hazard Mapping, in 2013; and
- Flood Risk Management Plans in 2015.

The **Office of Public Works** is the lead agency for flood risk management in Ireland. The coordination and implementation of Government policy on the management of flood risk in Ireland is part of its responsibility. The European Communities (Assessment and Management of Flood Risks) Regulations 2010 (S.I. No. 122) identifies the Commissioners of Public Works as the ‘competent authority’ with overall responsibility for implementation of the Floods Directive 2007/60/EC which includes requirements to prepare a preliminary assessment by 2011, flood risk mapping by 2013 and flood risk management plans by 2015. It is the principal agency involved in the preparation of Flood Risk Assessment and Management studies (FRAMs).

The PFRAs identified areas at risk of significant flooding and includes maps showing areas deemed to be at risk. The areas deemed to be at significant risk, where the flood risk that is of particular concern nationally, are identified as Areas for Further Assessment (AFAs) and more detailed assessment on the extent and degree of flood risk will be required in these areas.

DEHLG and OPW Flood Risk Management Guidelines

Introduction

In 2009, the DEHLG and OPW published Guidelines on flood risk management for planning authorities entitled “**The Planning System and Flood Risk Management - Guidelines for Planning Authorities**”, referred to throughout this report as “The Guidelines”. The Guidelines introduce mechanisms for the incorporation of flood risk identification, assessment and management into the planning process. Implementation of the Guidelines is intended to be achieved through actions at the national, regional, local authority and site-specific levels. Planning authorities and An Bord Pleanála are required to have regard to the Guidelines in carrying out their functions under the Planning Acts.

The core objectives of the Guidelines are to:

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

Principles of Flood Risk Management

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

The key principles of flood risk management set out in the Guidelines are to:

- Avoid development that will be at risk of flooding or that will increase the flooding risk
In other places, where possible;
- Substitute less vulnerable uses, where avoidance is not possible
- Justify. Ensure that the Development is being considered for strategic reasons and:
- Mitigate and manage the risk, where avoidance and substitution are not possible.

The Guidelines follow the principle that development should not be permitted in flood risk areas, particularly floodplains, except where there are no alternative and appropriate sites available in lower risk areas that are consistent with the objectives of proper planning and sustainable development.

Development in areas which have the highest flood risk should be avoided and/or only considered in exceptional circumstances (through a prescribed Justification Test) if adequate land or sites are not available in areas which have lower flood risk. Most types of development would be considered inappropriate in areas which have the highest flood risk. Only water-compatible development such as docks and marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation and essential transport infrastructure that cannot be located elsewhere would be considered appropriate in these areas.

Stages of SSFRA

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

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

FLOOD RISK AND FLOOD ZONES

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

$$\text{Flood risk} = \text{Likelihood of flooding} \times \text{Consequences of flooding}$$

Likelihood of flooding is normally defined as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. For example, a 1% Annual Exceedance Probability (AEP) indicates the severity of a flood that is expected to be exceeded on average once in 100 years, i.e. it has a 1 in 100 (1%) chance of occurring in any one year.

Consequences of flooding depend on the hazards associated with the flooding (e.g. depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality), and the vulnerability of people, property and the environment potentially affected by a flood (e.g. the age profile of the population, the type of development, presence and reliability of mitigation measures etc.).

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

Flood Zone A - High probability of flooding: Most types of development would be considered inappropriate in this zone. Development in this zone should be avoided and/or only considered in exceptional circumstances, such as in city and town centres, or in the case of essential infrastructure that cannot be located elsewhere, and where the Justification Test has been applied. Only water-compatible development, such as docks and marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation, would be considered appropriate in this zone. Zone A is described in Hydrological terms as where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding)

Flood Zone B - Moderate probability of flooding: Highly vulnerable development, such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses and primary strategic transport and utilities infrastructure, would generally be considered inappropriate in this zone, unless the requirements of the Justification Test can be met. Less vulnerable development, such as retail, commercial and industrial uses, sites used for short-let for caravans and camping and secondary strategic transport and utilities infrastructure, and water-compatible development might be considered appropriate in this zone. In general however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in Zone C and subject to a flood risk assessment to the appropriate level of detail to demonstrate that flood risk to and from the development can or will adequately be managed. Zone B is described in Hydrological terms as where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1%, or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding)

Flood Zone C - Low probability of flooding: Development in this zone is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast) but would need to meet the normal range of other proper planning and sustainable development considerations. Zone C is described in Hydrological terms where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

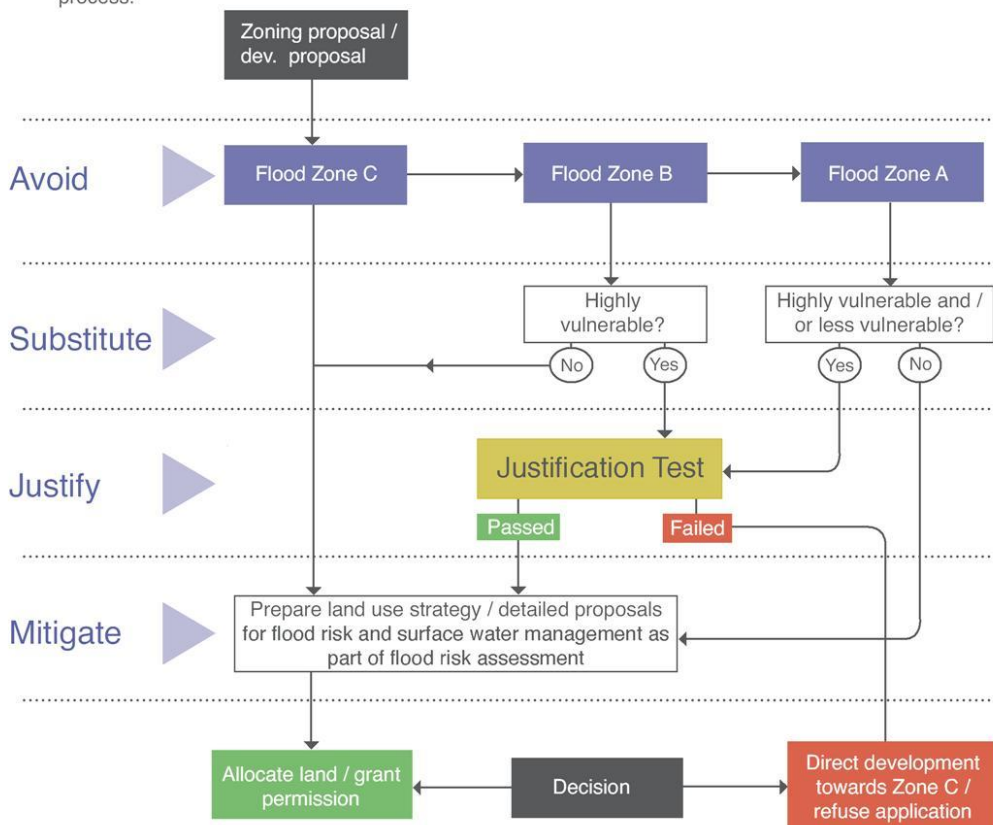
SEQUENTIAL APPROACH TO SSFRA

The guidelines set out in detail a sequential approach that it to be followed in the preparation of all Flood Risk Assessments. This approach therefore will be applied to the preparation of this SSFRA. To assist practitioners and Local Authorities in both preparing Flood Risk Assessments and formulating an opinion/decision based on same, the guidelines include a “Flow Diagram” setting out the various decisions to be made along the Planning process, a copy of this diagram is reproduced below for ease of reference.

It is further noted that the Kerry County Council Development plan 2022-2028 objective KCDP 11-66 requires Kerry County Council to have regard to and implement the recommendations and provisions of the Planning System and Flood Risk Management guidelines (DoEHLG 2009).

Sequential approach

3.2 A sequential approach to planning is a key tool in ensuring that development, particularly new development, is first and foremost directed towards land that is at low risk of flooding. Sequential approaches are already established and working effectively in other areas in the plan making and development management processes (e.g. retail planning). The sequential approach described in Fig. 3.1 should be applied to all stages of the planning and development management process. It is of particular importance at the plan-making stage but is also applicable in the layout and design of development within a specific site at the development management stage. Fig. 3.1 sets out the broad philosophy underpinning the sequential approach in flood risk management, while Fig. 3.2 describes its mechanism for use in the planning process.



Sequential Approach Flow Diagram

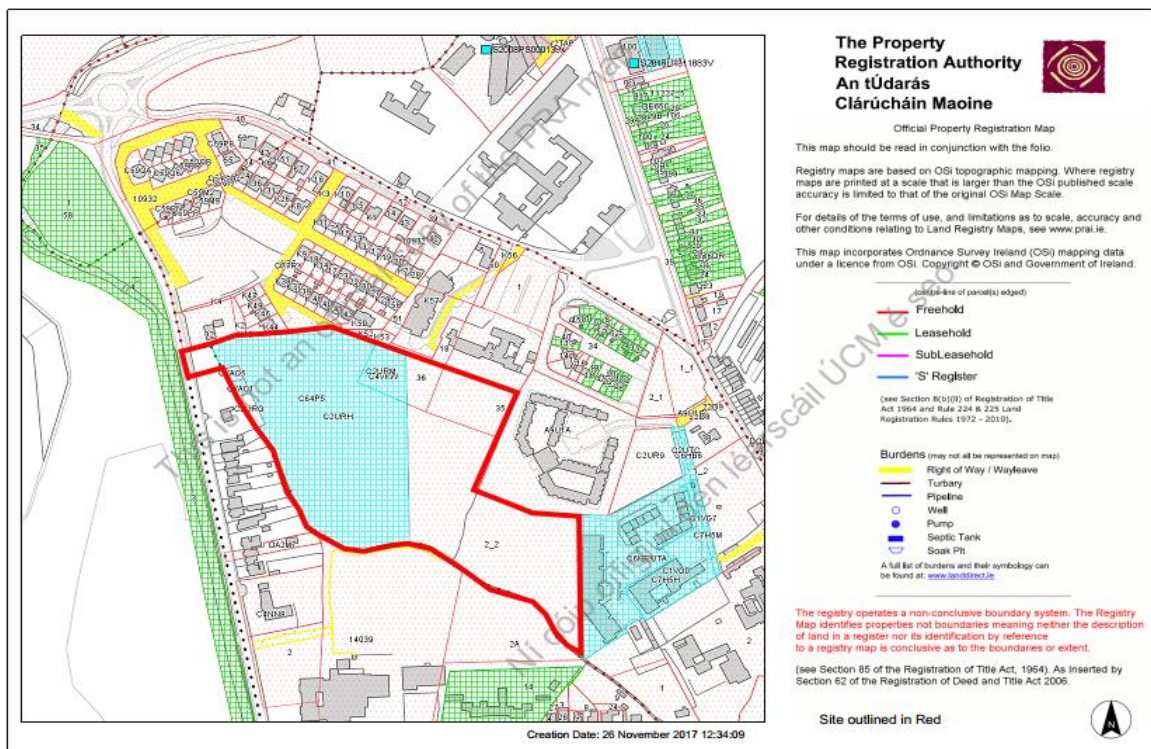
DESCRIPTION OF SITE AND DEVELOPMENT

The Assessment site is outlined on the enclosed Site Location Map. The site is located in the Town lands of Inch and Coollegrean. The site is located in close proximity to the River Deenagh. The current site is a Greenfield site. The overall area of the site in question is c. 5.30 Hectares.

The proposed development of the site involves the construction of residential units and ancillary structures compatible with the use of the site as a Residential Development. It is intended to connect to the Public Sewer and Drainage systems. It is proposed to connect to the Public Water supply available.

The development includes for the construction of habitable structures. The development is classified as a “**Highly vulnerable**”, as set out in Table 3.1 Classification of Vulnerability of different types of Development, of the Guidelines.

Given the nature and scale of the Development, and the Vulnerability classification of the proposed site usage, it is appropriate on this site to carry out a stage 1: Flood Risk Identification.



Site Location Map (Not to scale)

STAGE 1: FLOOD RISK IDENTIFICATION

Stage 1 SSFRA (flood risk identification) was undertaken in order to identify whether there may be any flooding or surface water management issues within the assessment site and consequently whether Stage 2/3 SSFRA (initial/detailed flood risk assessment) should be proceeded to. Identification is the process for deciding whether a plan or project requires a flood risk assessment and is essentially a desk-based exercise based on existing information. In order to establish whether a flood risk issue exists or may exist in the future, a range of sources should be consulted.

The prime source will ultimately be the flood zone maps produced by the OPW, but where these have not been prepared or are not on watercourses that will be covered by a CFRAM study then the planning body or developer will need to refer to alternative sources of information.

Table A4 of Appendix A of the Guidelines sets out the Primary sources of Information to be sourced when undertaking a SSFRA. These include:

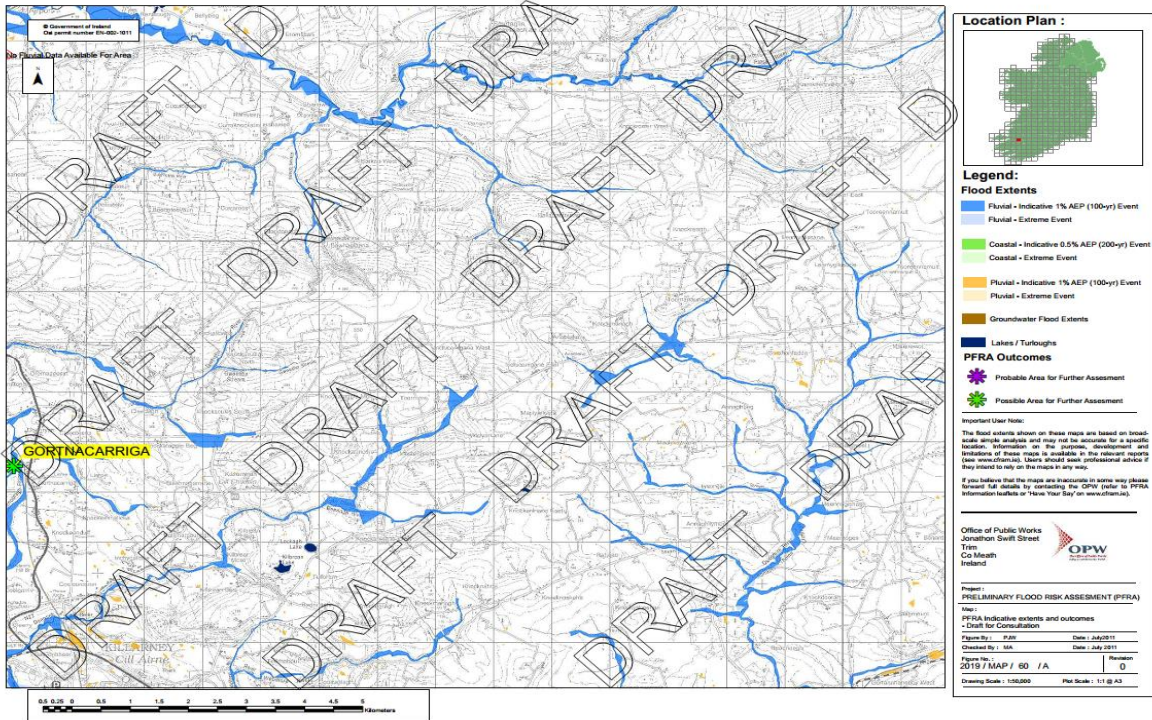
- OPW Preliminary Risk assessment (PRFA) indicative fluvial maps.
- National Coastal Protection Strategy Study flood and Coastal erosion risk maps.
- Predictive and historic flood maps and Benefitting lands maps, (www.floodmaps.ie).
- Alluvial Deposit maps produced by the Geological Survey of Ireland
- Predictive flood maps produced under the CFRAM Studies.
- River Basin Management plans and reports / National, Regional and Local Spatial plans
- Indicative assessment of existing flood risk under Preliminary Flood Risk Assessment.
- Consultation with Local Authority staff.
- Inspection of Topographic surveys.
- Information on flood defence and performance.
- “Liable to Flood” markings on Historic O.S. Maps.
- Local reports and newspapers / Interviews with locals.
- Walk over survey to assess potential sources of flooding, likely routes for water and the site’s key features, including flood defences and their condition.

OPW Preliminary Flood Risk Assessment (PFRA) Indicative Fluvial maps

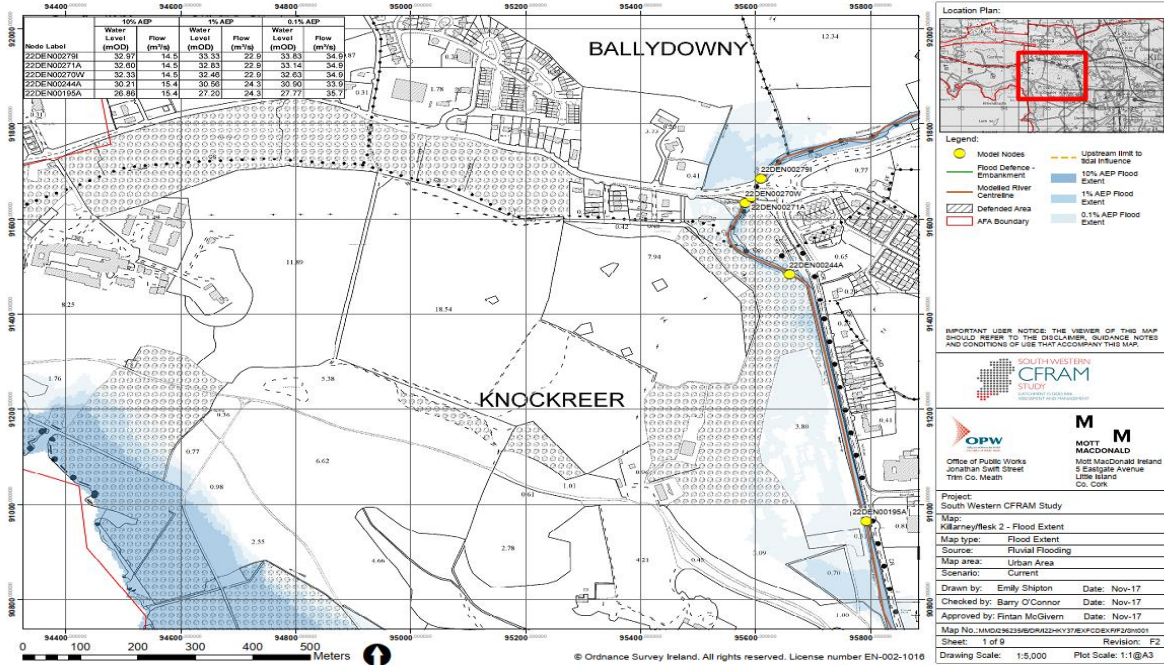
The OPW Preliminary Flood Risk Assessment (PFRA) indicative Fluvial mapping dataset has been arrived at by:

- Reviewing records of floods that have happened in the past;
- Undertaking analysis to determine which areas might flood in the future, and what the impacts might be; and
- Extensive consultation with each local authority, Government departments and agencies.
- This assessment has considered all types of flooding, including that which can occur from rivers, the sea and estuaries, heavy rain, groundwater, the failure of infrastructure, and so on. It has also considered the impacts flooding can have on people, property, businesses, the environment and cultural assets

The relevant PRFA Map for the assessment site is reproduced herein, PRFA Map 60 of flood Extents prepared by the OPW. This map indicates that the Site is located outside both the Fluvial Indicative 1% AEP and the Fluvial Extreme Event.



PFRA Map 60



CRFAM Mapping in the vicinity of the Assessment Site

This evidence is further supported by CFRAM Mapping available for the Assessment Site. The site is OUTSIDE both Zones A and B on the CFRAM Maps.

For flood risk purposes, based on the above, the Assessment site is outside both Zone A and Zone B

National Coastal Protection Strategy Study flood and coastal erosion risk maps
 Not Applicable to the Assessment site.

Predictive and historic flood maps and Benefitting lands maps
 The OPW Website holds a significant Dataset with regard to flood events. I refer you to OPW National Flood Hazard Map centred on the assessment site.

There is one single and no recurring flood events recorded by the OPW in the vicinity of the site. The Event Relates to “Hurricane Charlie” in August 1986

The screenshot displays the OPW National Flood Hazard Mapping interface. On the left is a map of the Killarney area with various flood hazard zones and landmarks. On the right is a search and results panel. The search criteria are set to County: Kerry and Town: Killarney. The search results show two flood events:

Event ID	Event Name	Start Date	County	Flood Quality Code
1	Flood Event: Fleck Killarney	01/Nov/1980	Kerry	3
2	Flood Event: Deenagh Killarney	05/Aug/1986	Kerry	4

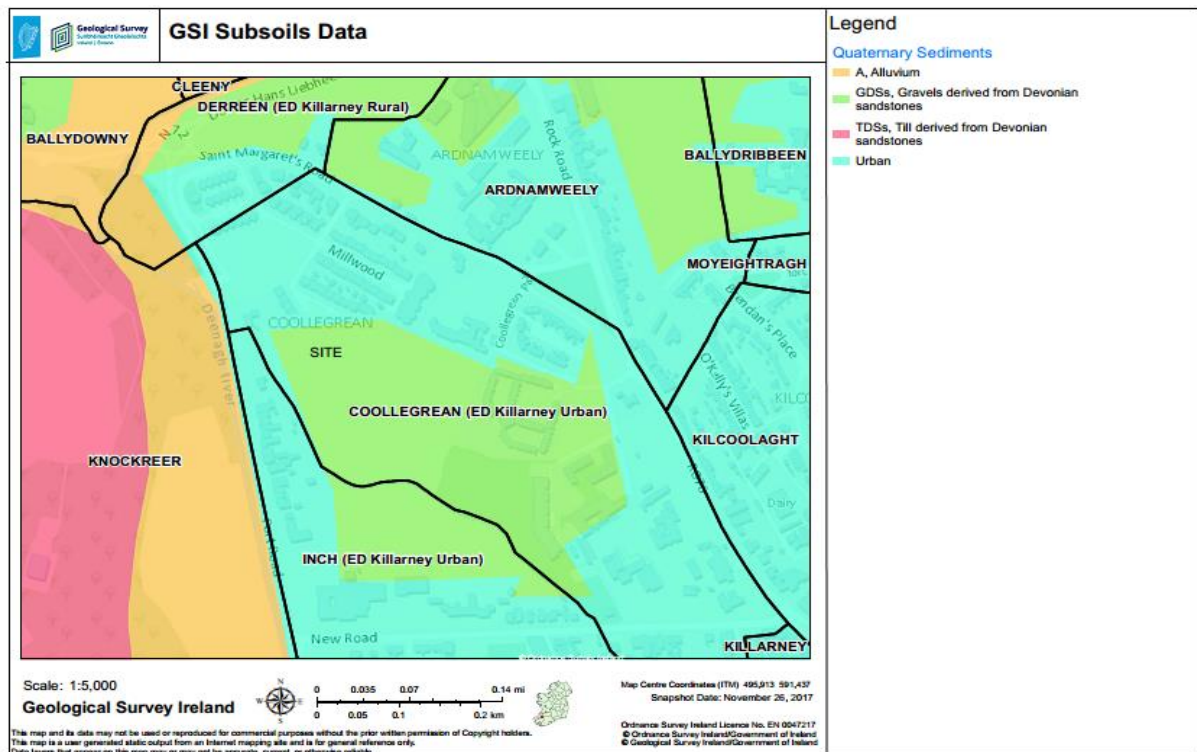
Each result includes a link for 'Additional Information' and 'Reports (1) More Mapped Information'.

OPW National Flood Hazard Map centred on development site

Alluvial Deposit Maps produced by the Geological Survey of Ireland

Mineral alluvial soil mapping is an An Teagasc dataset indicative of recurrent or significant fluvial flooding at some point in the past. These maps will be familiar to many, forming part of the information attached to a completed Site Characterisation form as required by the EPA Code of Practice, Wastewater Treatment systems for single Houses.

The attached map shows the assessment site not to have Alluvium Sub soils.



GSI Sub soils map

Predictive flood maps produced under the CFRAM Studies.

The CFRAM Study is published for the area. It shows the site in Zone C Development and is already reproduced in this Assessment.

Flood Event Reviews Continued
 For these flood events and others, Mott MacDonald Ireland in conjunction with OPW and Local Authorities have investigated and reviewed the cause and extent of the flooding. Details in relation to the extent and the depth of flooding is valuable as it is used to calibrate computer models to real flood events to improve the accuracy of the models. We would encourage people, where flooding has occurred and it is safe to do so, to photograph or record this information. Any information can be forwarded by post or email to the Communications Co-ordinator whose details are provided on the back page of this Newsletter.

HAVE YOUR SAY
 Visit our website to subscribe to our newsletter and to find out details of upcoming consultation events throughout the District. We welcome feedback from people who are interested in this study. Feedback can be provided on the website.
<http://www.southwestcframstudy.ie/>
 Follow us on Twitter to keep up to date with the latest events in the CFRAM Study:
www.twitter.com@SW_CFRAM_Study

UPCOMING WORK
 Due to the prioritisation of the Clonakilty AFA, public consultations for the flood mapping and option development for this location will be held in the near future. In addition, upcoming work will include hydrological analysis and hydraulic modelling for the other AFA's and the Strategic Environmental Assessment Scoping Report for the overall study.


Future Work - Programme
 Work on the South Western CFRAM Study is due to continue until 2016. Some Key dates for the delivery of the study are shown below:

Activity	Date
Surveys Complete	Early 2013
Hydraulic Modelling Complete	October 2013
Flood Map Consultation	Late 2013
Flood Risk Management Measures Consultation	Late 2014
Strategic Environmental Assessment (SEA) (Draft)	Late 2014
Consultation on FRMP and SEA	Late 2015

CONTACT US
 The Communications Co-ordinator for the South Western CFRAM Study can be contacted by Post or Email.
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 5 Eastgate Avenue
 Eastgate
 Little Island
 Co. Cork
By Email: SWCFRAM@mottmac.com
 As previously mentioned, any information in relation flood events can be forwarded to the Communications Co-ordinator for review.

USEFUL WEBSITES
 National CFRAM website:
<http://www.cfram.ie>
 Southwestern CFRAM website:
<http://www.southwesterncframstudy.ie>

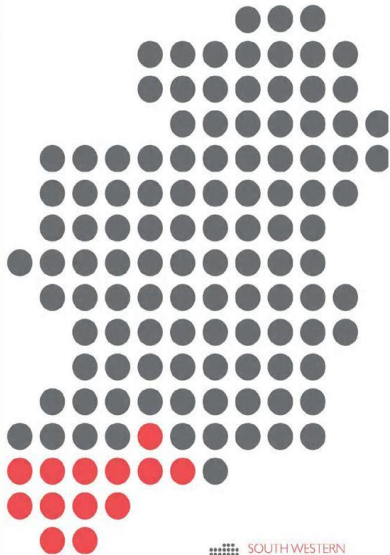





SOUTH WESTERN CFRAM STUDY

Newsletter

Number Two February 2013





Excerpt of CFRAM Newsletter 2, 2013

River Basin Management plans and reports / National, Regional and Local Spatial plans

Reference is made in this SSFRA to the Kerry County Council Strategic FRA. The principles and objectives described therein have been incorporated into this SSFRA.

Indicative assessment of existing flood risk under Preliminary Flood Risk Assessment

Based on the data achieved at this Stage it appears that the Assessment site is not located on Zone A or Zone B. The Assessment site is outside the river Deenagh Flood Plain.

In fact based on the historic mapping of the site, the difference in levels between the River bank and the downstream receiving lands, the likelihood of any associated fluvial flood risk is MINIMAL, and in the order of less than 1 in 1000, (Zone C).

This view is further supported by PRFA mapping and CFRAM maps inspected

Local Reports and Newspapers

There is reference to flooding in the environs of the Deenagh River on the OPW website.

“Liable to Flood” Markings on Historic O.S. Maps

The Ordnance Survey of Ireland (OSI) 6” mapping identifies broad areas as being Liable to Floods. There are several limitations to the use of this mapping, such as the following:

- The OSI maps simply show the text “Liable to Floods” without delineating the extent of these areas. For the purposes of these draft maps a GIS system has been used to indicate the likely potential extent of these areas.
- As these maps were based on survey work carried out from 1833-1844 with many updated in the 1930s and 40s, they do not show or take any account of recent changes including changes in surface drainage, such as development in floodplains, road realignments or drainage works for forestry or agriculture.

So there is significant potential that flood risk in some areas may have increased or reduced since they were prepared. **There is no reference to flooding on the Historic O.S. Maps.**

SUMMARY OF STAGE 1: FLOOD RISK IDENTIFICATION

I am of the opinion that based on material and Information gathered at this stage that there is a very low potential risk of flooding on the site. On this basis I recommend that the SSFRA moves on to Stages 2/3.

JUSTIFICATION TEST

This test, explained in Section 4 of the Guidelines, has been designed to assess the appropriateness of Development that are being considered in areas of moderate or high flood risk. The test sets out the criteria which must all be met when zoning lands that are at moderate or high risk of flooding, for uses or developments which are vulnerable to flooding.

These criteria are:

- The settlement is targeted for growth under the National Spatial Strategy, Regional Planning Guidelines or certain statutory plan of guidelines.
- The zoning is required to achieve the proper planning and sustainable development of the settlement.
- A flood risk assessment carried out to an appropriate level of detail demonstrates that flood risk to the development can be adequately managed and there will be no adverse impacts elsewhere.

The Guidelines set out in table 3.1, the Classification of vulnerability of different types of development. The proposed development is classified as a **Highly Vulnerable** Development.

In our Stage 1 Flood Risk Identification, it has been established that there is a very low potential risk of flooding of the site and that the Assessment site is located **in Zone C**.

On combining these outcomes and consulting table 3.2 of the Guidelines, (Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test), it is established that the **PROPOSED DEVELOPMENT IS APPROPRIATE**.

Based on the Sequential Flow Diagram it has therefore been established that the SSFRA can now proceed to the preparation of detailed proposals for flood risk and surface water management as part of the SSFRA. Given the small scale and nature of the Development both Stage 2 and 3 of the SSFRA have been combined.

On analysis of information to hand it appears that the proposed development is consistent with the Zoning Objectives as set out in the Kerry County Development Plan 2022-2028 with regard to Flood risk.

STAGE 2/3: INITIAL FLOOD RISK ASSESSMENT/DETAILED FLOOD RISK ASSESSMENT

A Stage 2/3 SSFRA (initial/detailed flood risk assessment) was undertaken to:

- Confirm the sources of flooding that may affect the Development area.
- Appraise the adequacy of existing information as identified by the Stage 1 SSFRA.
- Scope the extent of the risk of flooding.
- Assess Flood Risk impact on flood risk elsewhere.
- Carry out design of compensatory measures and assess the effectiveness of proposed mitigation measures.

Flood Risk Indicator Information Considered

Flood risk indicator information which was considered during the Stage 2/3 SSFRA included the material obtained at Stage 1 of this assessment and the Topographic information available relative to the Assessment site.

Appraisal of the Adequacy of Existing Information

The flood risk indicator information which was considered, including the PFRA mapping, alluvium soils mapping, the mapping from OPW “www.floodmaps.ie” Website and Kerry/Killarney Flood Plain Mapping was consistent with what is observed on the site. It is noted that CFRAM Mapping is available for the area.

Examination of all sources of flooding that may affect the Development site

Sources of Flooding

This SSFRA has considered flood risk from fluvial, pluvial, groundwater sources, drainage systems, reservoirs and canals and other artificial or manmade systems.

Fluvial Flooding

Flooding of watercourses is associated with the exceedance of watercourses. It depends on a number of characteristics associated with the catchment including; geographical location and variation in rainfall, steepness of the channel and surrounding floodplain and infiltration and rate of runoff associated with urban and rural catchments. Generally there are two main types of catchments, large and relatively flat or small and steep, the two giving two very different responses during large rainfall events. In a large, relatively flat catchment, flood levels will rise slowly and natural floodplains may remain flooded for several days, acting as the natural regulator of the flow. In small, steep catchments, local intense rainfall can result in the rapid onset of deep and fast-flowing flooding with little warning. Such “flash” flooding, which may only last a few hours, can cause considerable damage and possible threat to life. Critical structures such as bridge and culverts can also significantly reduce capacity creating pinch points within the floodplain. These structures are also vulnerable to blockage by natural debris within the channel or by fly tipping and waste.

Rivers are the primary cause of flooding in the Killarney Area, with flood events attributed to fluvial sources ranging from the major rivers, including the River Deenagh.

The primary sources of fluvial flooding associated with Port Road/Demense area are the river Deenagh and associated streams and watercourses.

THE LAYOUT AND DESIGN CAN BE MANAGED IN ORDER TO MINIMISE RISK. Factors to consider include, (List not exhaustive):

- The construction of open channel drainage in lieu of existing drainage networks.
- The use of permeable Construction materials and flood resilient materials in the construction of the walkway.
- **The use of SUDS Drainage Systems. I note that this is already incorporated in the development**
- The use of a Minimal amount of fixtures in the drainage systems.

Coastal Flooding

Not applicable

Other sources of Flooding

Pluvial Flooding

Pluvial flooding is a result of rainfall generated overland flows of water. Flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours. The resulting water follows natural valley lines, creating flow paths along roads and through and around developments and ponding in low spots, which often coincide with fluvial floodplains in low lying areas. The PRFA or CFRAM Maps have not identified Pluvial Areas in the immediate vicinity of the site. Given the occurrence of Flash flood events in the area of recent times, Pluvial Flooding is still considered in this assessment as a risk.

This risk can however be minimised by ensuring that during the course of construction and operation of the Development, the existing watercourses are maintained and enhanced.

Groundwater Flooding

Groundwater flooding is caused by the emergence of water originating from underground, and is particularly common in karsified landscapes. This can emerge from either point or diffuse locations. The occurrence of groundwater flooding is usually very local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises.

In this respect they are considered as relatively low flow rates and would not contribute significantly in Extreme weather events. Groundwater Flooding is therefore not considered as a significant Flood Risk.

Flooding from Drainage Systems and associated watercourses

Flooding from artificial drainage systems occurs with flow entering a system, such as an urban storm water drainage system, exceeds its discharge capacity, it becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. Sewer flooding problems will often be associated with regularly occurring storm events during which sewers and associated infrastructure can become blocked or fail.

The most notable feature associated with the assessment site regarding Infrastructure, Drainage Systems and associated watercourses is:

- The folly Stream which runs along the Southern boundary of the site.

The main risk of flooding at this upstream location arises from blockages to the culvert that crosses New Road at the south of the development. The capacity of same is sufficient under normal and extreme rainfall events, but it poses a risk of becoming blocked with debris on the upstream side of the culvert during a storm event and this could cause the folly stream channel to overflow. As far as I am aware, the Culvert has not been associated with any Flooding events due to blockages.

In relation to the folly stream itself, the 1% AEP Flow rate for the total catchment area (8.20 Hectares) has been calculated at **0.62 m³/sec.** (allowing for 20% increase in rainfall intensity due to climate change), whereas the Folly Stream Channel Capacity has been calculated at **0.72 m³/sec.** (Using Manning's formula for flow in open Channels). Therefore the Folly Stream Channel capacity exceeds the 1% AEP Flow rate and the stream will be able to accommodate this flow without overtopping the stream banks.

FLOOD IMPACT ON DEVELOPMENT AND ADJOINING LANDS

The Development is classified as a **“Highly vulnerable”**, as set out in Table 3.1 Classification of Vulnerability of different types of Development, of the Guidelines. The nature, area and Extent of development are small in nature. The Flood risk impact on the section of the Development located in flood Zone C is therefore low. The flood risk impact will be minimised by the use of construction techniques as set out previously in this assessment and by maintaining existing Ground levels on the site.

Based on the SSFRA there is no flood risk attributable to this Residential Development and therefore no associated impact.

PROPOSALS FOR SURFACE WATER MANAGEMENT

In order to achieve best practice drainage characteristics for the development it is proposed that the Development is served by a Sustainable Urban Drainage System. The Exact detail of same can be varied due to Planning Authority requirements or Client Site Specific Requirements. I also note that as part of the RFI request that the exact detail of storm water management is to be modified in line with KCC Operation Department requirements.

The proposals that are to be employed regarding Surface Water Management should minimise any adverse effect possibly created by the development with regard to the existing drainage characteristics and should provide onsite storage for any run off associated with the development , so as to achieve a “Greenfield” approach to the solution for the site.

Find enclosed MET Eireann Data relating to Extreme Rainfall events.

Met Eireann Extreme Rainfall Data for Port Road

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 95801, Northing: 91457,

DURATION	Interval		Years															
	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,		
5 mins	2.8,	3.7,	4.2,	4.9,	5.4,	5.7,	6.8,	8.0,	8.8,	9.9,	10.8,	11.5,	12.6,	13.4,	14.1,	N/A,		
10 mins	3.9,	5.2,	5.9,	6.8,	7.5,	8.0,	9.5,	11.2,	12.3,	13.8,	15.1,	16.1,	17.6,	18.7,	19.6,	N/A,		
15 mins	4.6,	6.1,	6.9,	8.1,	8.8,	9.4,	11.2,	13.2,	14.4,	16.2,	17.7,	18.9,	20.6,	22.0,	23.1,	N/A,		
30 mins	6.4,	8.3,	9.3,	10.8,	11.7,	12.4,	14.7,	17.2,	18.8,	21.0,	22.8,	24.3,	26.4,	28.0,	29.4,	N/A,		
1 hours	8.7,	11.3,	12.6,	14.4,	15.6,	16.5,	19.4,	22.5,	24.4,	27.1,	29.4,	31.2,	33.8,	35.8,	37.4,	N/A,		
2 hours	12.0,	15.3,	16.8,	19.3,	20.8,	21.9,	25.5,	29.4,	31.8,	35.1,	37.9,	40.0,	43.2,	45.6,	47.5,	N/A,		
3 hours	14.5,	18.3,	20.2,	22.8,	24.6,	25.9,	30.0,	34.3,	37.1,	40.8,	43.9,	46.3,	49.9,	52.6,	54.7,	N/A,		
4 hours	16.5,	20.7,	22.8,	25.8,	27.7,	29.1,	33.6,	38.4,	41.4,	45.4,	48.8,	51.4,	55.2,	58.1,	60.5,	N/A,		
6 hours	19.9,	24.7,	27.2,	30.6,	32.8,	34.4,	39.5,	44.9,	48.2,	52.8,	56.6,	59.5,	63.8,	67.0,	69.6,	N/A,		
9 hours	23.9,	29.5,	32.3,	36.2,	38.7,	40.6,	46.4,	52.5,	56.3,	61.3,	65.6,	68.9,	73.7,	77.3,	80.2,	N/A,		
12 hours	27.3,	33.5,	36.6,	40.9,	43.6,	45.7,	52.0,	58.6,	62.8,	68.3,	72.9,	76.4,	81.6,	85.5,	88.6,	N/A,		
18 hours	32.8,	40.0,	43.5,	48.5,	51.6,	53.9,	61.1,	68.6,	73.2,	79.4,	84.6,	88.5,	94.2,	98.5,	102.0,	N/A,		
24 hours	37.4,	45.4,	49.3,	54.7,	58.1,	60.7,	68.5,	76.6,	81.6,	88.3,	93.9,	98.1,	104.3,	109.0,	112.7,	125.1,		
2 days	48.3,	57.9,	62.5,	68.9,	72.9,	75.9,	85.0,	94.4,	100.2,	107.8,	114.2,	119.0,	126.0,	131.2,	135.4,	149.2,		
3 days	57.7,	68.6,	73.8,	81.0,	85.6,	88.9,	99.2,	109.7,	116.1,	124.6,	131.7,	136.9,	144.6,	150.4,	155.0,	170.1,		
4 days	66.3,	78.4,	84.1,	92.1,	97.1,	100.8,	112.0,	123.5,	130.5,	139.7,	147.5,	153.2,	161.5,	167.7,	172.7,	189.1,		
6 days	82.0,	96.2,	103.0,	112.3,	118.1,	122.4,	135.4,	148.6,	156.7,	167.2,	176.1,	182.6,	192.1,	199.2,	204.8,	223.3,		
8 days	96.5,	112.7,	120.3,	130.8,	137.4,	142.2,	156.8,	171.6,	180.6,	192.4,	202.2,	209.4,	220.0,	227.8,	234.0,	254.5,		
10 days	110.3,	128.3,	136.8,	148.4,	155.6,	160.9,	177.0,	193.2,	203.1,	216.0,	226.7,	234.6,	246.1,	254.6,	261.4,	283.6,		
12 days	123.6,	143.3,	152.5,	165.2,	173.1,	178.9,	196.3,	213.9,	224.6,	238.5,	250.1,	258.6,	271.0,	280.1,	287.4,	311.3,		
16 days	149.2,	172.1,	182.8,	197.4,	206.4,	213.1,	233.1,	253.3,	265.4,	281.3,	294.4,	304.1,	318.1,	328.5,	336.8,	363.7,		
20 days	173.9,	199.7,	211.8,	228.2,	238.4,	245.9,	268.3,	290.8,	304.3,	322.0,	336.6,	347.3,	362.9,	374.4,	383.5,	413.3,		
25 days	203.9,	233.3,	247.0,	265.5,	277.0,	285.4,	310.7,	335.9,	351.1,	370.8,	387.2,	399.1,	416.5,	429.3,	439.5,	472.6,		

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
"Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin",
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

SUMMARY OF STAGE 2/3 OF SSFRA

Stage 2/3 of the Site Specific Flood Risk Assessment has:


- Identified all potential sources of flooding.
- Identified the potential impact of flooding on the site as being a low impact.
- Taken measures to alter the layout and design in order to minimise flood risk and flood impact.
- Provided design detail for Surface Water Management on the site.

I am of the opinion that based on material and Information gathered at stage 2/3, **there are minimal risks of flooding on this Assessment Site. Therefore the Residential Development avoids significant risks of flooding in line with the Ministerial Guidelines**

Stage 2/3 of the SSFRA has established sufficient quantitative information is available, appropriate to the scale and nature of the proposed Development for the necessary decision to be reached by both the Assessor and the Planning Authority **in accordance with Sequential approach Flow Diagram and the Guidelines in general.**

Having regard to the outcomes achieved in stage 2/3 of this SSFRA, it is considered that the avoidance and Mitigation Principles have been applied in an appropriate manner.

Site Specific Flood Risk Assessment prepared by:



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10th May 2024