Strategic Flood Risk Assessment (SFRA)

Woodbrook - Shanganagh

Local Area Plan 2017 - 2023

Appendix 7

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Woodbrook-Shanganagh

Local Area Plan 2017-2023

August 2017

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Appendices to SFRA

1.1 Introduction

This Flood Risk Assessment (FRA) of the Woodbrook Shanganagh Local Area Plan (LAP) has been prepared and informed having regard to *'The Planning System and Flood Risk Management Guidelines for Planning Authorities', 2009* (DEHLG & OPW) and the Strategic Flood Risk Assessment (SFRA) undertaken at County level for Dún Laoghaire-Rathdown undertaken as part of the recently adopted Dún Laoghaire-Rathdown County Development Plan 2016-2022 (Appendix 13).

The DEHLG / OPW Guidelines state that Planning Authorities are required to introduce flood risk assessment as an integral and leading element of their development plan functions. It sets out that Development Plans and Local Area Plans must establish the flood risk assessment requirements for their functional area. The Guidelines further state that flood risk management should be integrated into spatial planning policies at all levels to enhance certainty and clarity in the overall planning process.

A Strategic Flood Risk Assessment (SFRA) is an area-wide assessment of the existing risks of flooding and the impact of those risks arising from proposed spatial planning decisions. A staged approach has been adopted in the preparation of this FRA, as advocated under the Guidelines.

Stage 1: Identifies if the area is at risk of flooding and if so, the principal sources of flooding.

Stage 2: Flood Risk Assessment confirms sources of flooding that affect the Plan area and involve the preparation of a flood zone map, based on best available data. This assessment will also detail a flood management strategy for the Plan area, if necessary.

Stage 3: Where a detailed Flood Risk Assessment is required to assess flood risk areas in sufficient detail and to provide quantitative appraisal of potential flood risk to a proposed or existing development, a Stage 3 Flood Risk Assessment will be carried out.

The Guidelines require the planning system at National, Regional and Local levels to:

A: Avoid developments in areas at risk of flooding, particularly flood plains, unless there are proven wider sustainability grounds that justify appropriate development and where the flood risk can be reduced or managed to an acceptable level without increasing flood risk elsewhere.

B: Adopt a sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction and mitigation of flood risk, and incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

1.2 Flooding & Strategic Environmental Assessment (SEA)

The Planning System and Flood Risk Management Guidelines for Planning Authorities, 2009 (DEHLG & OPW), also set out best-practice in terms of integrating Strategic Flood Risk Assessment (SFRA) and Strategic Environmental Assessment.

In this regard, Section 3.10 of the Guidelines states that '*The SEA Process provides a good practice framework for scoping and considering a range of planning and environmental issues, including flooding in the plan making process'* and that '*Flood risk assessments carried out in response to these Guidelines, should be integrated with the SEA process'*.

The Guidelines further state that '*Where SEA and the environmental report is required, flood risk assessment should be undertaken as early as possible in the process so that the SEA is fully informed of the flood risks and impacts of the proposed zoning or development (See Appendix A)'.*

Accordingly, this SFRA for the Woodbrook Shanganagh LAP (WS LAP) has been prepared at the very outset of the plan-making process, as a working document to align with the initial scoping stage for the SEA. In this way, it is envisaged that the SFRA may be integrated into the parallel SEA Process.

1.3 Flood Risk Management – Development Plan Policy

Section 5.2.5.2 of the Dún Laoghaire Rathdown County Development Plan, Policy CC15, relates to Flood Risk Management and states that:

'It is Council policy to support, in cooperation with the OPW, the implementation of the EU Flood Risk Directive (2007/60/EC) on the assessment and management of flood risks, the Flood Risk Regulations (SI No 122 of 2010) and the Department of the Environment, Heritage and Local Government and the Office of Public Works Guidelines on 'The Planning System and Flood Risk Management, (2009)' and relevant outputs of the Eastern District Catchment and Flood Risk Assessment and Management study (ECFRAMS Study)

Section 5.2.5.2 further states that the Council will ensure the implementation of the DoEHLG /OPW Guidelines 'The Planning System and Flood Risk Management', (2009) and DoEHLG Circular Pl/2014 (or any updated superseded document) in relation to flood risk management within the County.

It refers to the Strategic Flood Risk Assessment of the County undertaken as part of the County Development Plan process (Appendix 13), and that the implementation of the Guidelines will include, inter alia, the following:

- Avoid, reduce and / or mitigate, as appropriate in accordance with the Flood Risk Management Guidelines, the risk of the flooding within the flood risk areas that may be identified during the period of the Plan or in relation to planning application (Refer to Appendix 13).

- Flood Risk Management and Strategic Flood Risk Assessment (SFRA) shall be incorporated into the preparation of all Local Area Plans and any other lower tier plans.

- Regard shall be had to any future flood hazard maps, flood risk maps and flood risk management plans prepared as part of the Eastern District Catchment Flood Risk Assessment and Management Study and future iterations of other similar studies of impacts of climate change.

Having regard to the DEHLG / OPW Guidelines and the County Development Plan policy, a Flood Risk Assessment (FRA) has been prepared for the WS LAP Area.

1.4 Woodbrook-Shanganagh Local Area Plan – Statutory Context

The Woodbrook-Shanganagh Local Area Plan (LAP) is designated under the Core Strategy of the Dún Laoghaire-Rathdown County Development Plan 2016-2022 as a 'Future Development Area' and is in part zoned Zoning Objective: A1 '*To provide for new residential communities in accordance with approved Local Area Plans'.*

Under the Core Strategy, the potential residential yield of these lands is identified as circa 2,300 Units, or circa 6,200 Persons.

The WS LAP has been prepared in accordance with Sections 18-20 of the Planning and Development Act, 2000 (as amended). The parallel environmental assessments, namely, Strategic Environmental Assessment SEA), Appropriate Assessment (AA) and Strategic Flood Risk Assessment (SFRA) have been undertaken in tandem, as iterative processes, informing the preparation of Local Area Plan (LAP).

1.5 Description of Plan Area

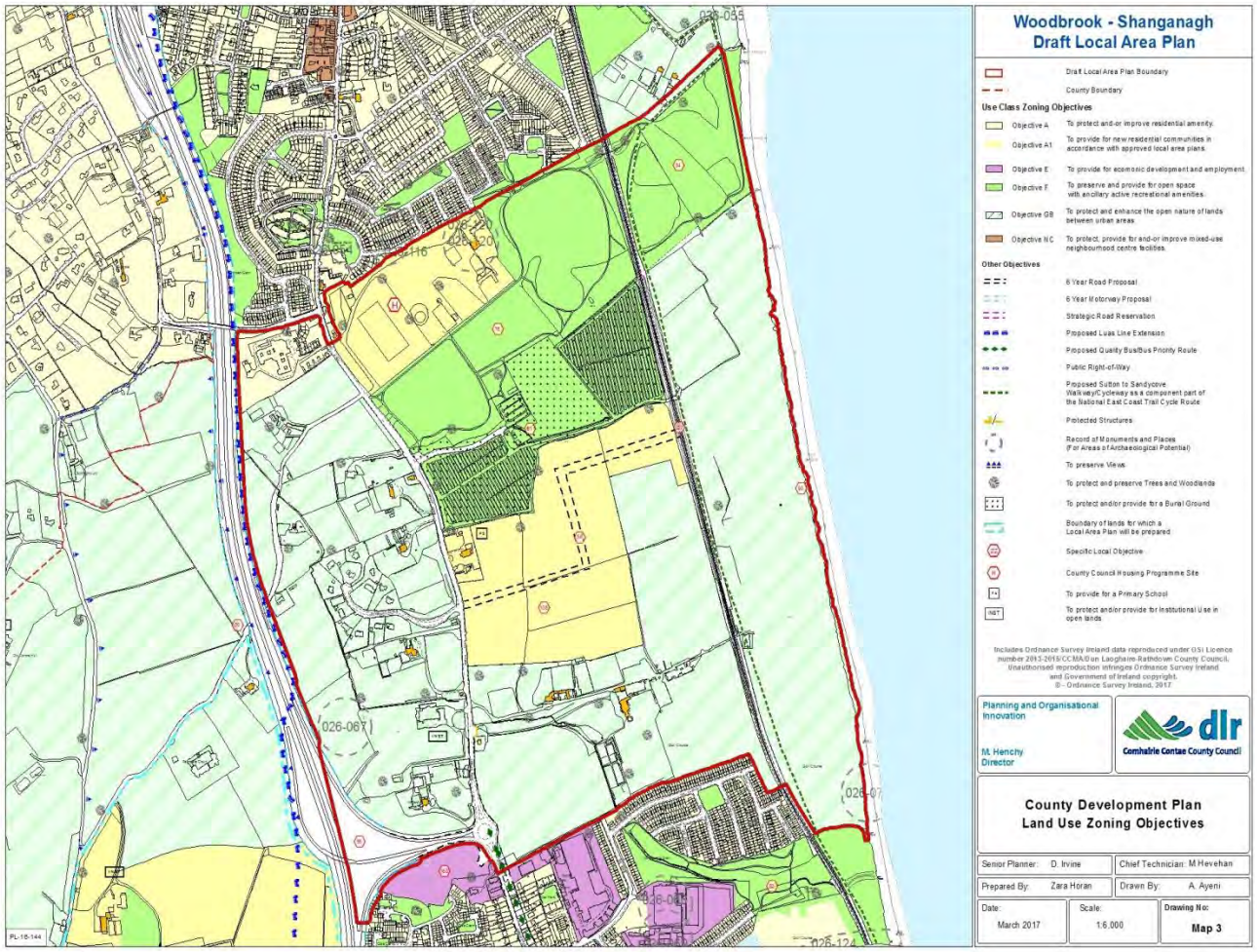
The Woodbrook-Shanganagh LAP Area is located within a greenbelt area between Shankill and Bray, circa 7km south of Dún Laoghaire Town. The Plan lands comprise of largely undeveloped greenfield lands in part zoned for greenbelt (Zoning Objective GB) and open space, recreational purposes (Zoning Objectives F), as well as two significant parcels of land at Woodbrook (21ha) and Shanganagh Castle (11ha) zoned for the creation of sustainable residential communities (Zoning Objective A1). The Plan Area, thereafter, includes circa 32 ha of lands zoned for essentially residential development, and supporting community or social infrastructure.

The Plan lands have the capacity to accommodate circa 2,300 units, or 6,200 persons, based on net densities of 80-100 units per ha at Woodbrook and 65-75 units per ha at Shanganagh Castle, as provided under the existing WS LAP 2006-2016. These densities were reviewed as part of the preparation of the Draft 2017-2023 LAP and it considered that a wider density range is appropriate to cater for different housing typologies, with a minimum average net density of 60 units per hectare to apply to each of the development parcels, which would potentially result in a build-out of circa 1,600 – 2,300 Units.

The Plan Area is located in its entirety within the Dublin Metropolitan Area, the consolidation of which is an objective under higher level National and Regional policy. The DART Line, with proposed access from a planned new station at Woodbrook, provides for a sustainable settlement with high levels of quality public transport accessibility. The National Transport Authority's 'Greater Dublin Area Transport Strategy-2016-2035' provides for a DART Station at Woodbrook and also envisages extension of the Luas Line from Cherrywood to the Bray Area, subject to the scale of new development and an economic assessment.

In addition to the two significant development parcels at Woodbrook and Shanganagh Castle, the Plan boundary includes extensive greenbelt lands relating to Woodbrook Golf Club, as well as Shanganagh Park, which is a large scale public park zoned for open space with ancillary active recreational amenities and likely to be enhanced to function as a Regional Park.

Fig 1: Woodbrook-Shanganagh LAP Plan Boundary Area



1.6 Identification of Flood Risk

i. Strategic Flood Risk Assessment - County Development Plan 2016-2022

A Strategic Flood Risk Assessment (SFRA) was undertaken for the recently adopted County Development Plan 2016-2022, the purpose of which was to provide sufficient information to allow proper planning decisions to be made on sites at risk of flooding over the lifetime of the County Development Plan 2016-2022 and to ensure that the necessary information with regard to flooding, the 'Sequential Approach' and the 'Justification Test' was available as part of the decision-making process of the County Development Plan. The SFRA for the County Development Plan identifies flood risk zones throughout the County (Appendix 13 of CDP).

For the SFRA for the County Development Plan, a two-stage assessment of flood risk was undertaken for the entire County area, as recommended in the 'The Planning System and Flood Risk Management' Guidelines.

The first stage identified flood risk and developed Flood Zone Maps which confirmed that a proportion of zoned lands are at flood risk. The second stage, and the main purpose of the SFRA report, highlighted development areas that require more detailed assessment on a site specific level. The SFRA also provides guidelines for development within areas at potential risk of flooding, and specifically looks at flood risk and the potential for development across the County.

The SFRA for the CDP provides a background to flood risk in Dún Laoghaire-Rathdown, including a review of available flood risk information and a summary of sources of flooding. It also provides an overview of flood management policy which includes details of development which may be appropriate in certain areas and the expected content of site specific FRAs. The Justification Test has been applied across the County, with particular regard to the major growth areas as identified under the Core Strategy.

The SFRA for the County Development Plan sets out the definition of the Flood Zones as per the OPW Flood Guidelines, with reference to the high, moderate or low-risk of flooding from fluvial or tidal sources, being based on an undefended scenario which does not take into account the presence of existing or proposed flood protection structures such as flood walls or embankments. The set of supplementary maps categorises the entire county area according to these flood zones (Flood Zones A-C).

ii. Data & Flood Zone Maps of County Development Plan 2016-2022

The SFRA of the County area undertaken for the County Development Plan utilises a number of datasets relating to historical or predicted flood extents. The Identification of Flood Risk (Stage 1), identified flood risk based on the data available, including historical records and a range of data sources (See Table 3.1, Appendix 13 SFRA, P. 9).

The Catchment Flood Risk Assessment and Management (CFRAMS) for the Eastern Region, which includes DLR, were being finalised at the time of the Draft Plan process. Notwithstanding the flood extent maps which were available at the time of the SFRA, and had been the subject of several iterations throughout the CRFRAM process were considered to be of high quality in most locations.

This information was compiled into the Flood Zone Maps that form the basis of the SFRA for the County Development Plan, which in turn guided Development Plan policy and informed the application of the Justification Test. However, the SFRA cautions that the input data was developed at a point in time and that, as a result, there may be changes

in the catchment that mean a future study, or more localised assessment of risk, may result in a change in either flood extent or depth. In this regard the SFRA notes that, this means that a site specific flood risk assessment may result in more locally accurate information which could show a greater or less level of risk than is included in the Flood Zone Maps.

The Eastern CFRAMS process commenced in 2011 to (i) assess flood risk through identification of flood hazard areas, (ii) identify viable structural and non-structural measures and options for managing the flood risk, and (iii) prepare a Flood Risk Management Plan (FRMP) and Strategic Environmental Assessment that sets out the measures and policies to be pursued. The CFRAM studies have been used as the basis of the SFRA for the higher level County Development Plan.

The Council acknowledges that the CFRAM studies are a work in progress, with public consultation undertaken in October 2016 by the OPW, as the lead agency. In this regard, Section 6.2.5.1, Policy CC14: Catchment Flood Risk Assessment and Management (CFRAM), of the County Development Plan, states as follows: '*It is Council policy to assist the Office of Public Works (OPW) in the preparation of the Regional Catchment Flood Risk Assessment (CFRAM) Study being carried out for the Eastern District. Any recommendations and outputs arising from the CFRAM study for the Eastern District that are relevant for Dún Laoghaire Rathdown will require to be incorporated into the Development Plan'.* Accordingly, the SFRA of the Woodbrook Shanganagh LAP may require to be subsequently revised, if necessary.

iii. Flood Zone Maps – SFRA of County Development Plan

Utilising the CFRAM Studies and other data sources, Flood Zone Maps for the entire County were prepared as part of the SFRA for the County Development Plan. The Flood Zone Maps show Flood Zones A, B, and C and also show historical and predicted flooding hotspots in the County.

iv. Definition of Flood Zones

Flood Zone	Description
Zone A **High Probability of Flooding**	This zone defines areas with the highest risk of flooding from rivers (i.e. more than 1% probability or more than 1 in 100) and the coast (i.e. more than 0.5% probability or more than 1 in 200)
Zone B **Moderate Probability of Flooding**	This zone defines areas with a moderate risk of flooding from rivers (i.e. 0.1% to 1% probability or between 1 in 100 and 1 in 1000) and the coast (i.e. 0.1% to 0.5% probability or between 1 in 200 and 1 in 1000)
Zone C **Low Probability of Flooding**	This zone defines areas with a low risk of flooding from rivers and the coast (i.e. less than 1 in 1000)

(Source: The Planning System and Flood Risk Management – Guidelines for Planning Authorities, 2009)

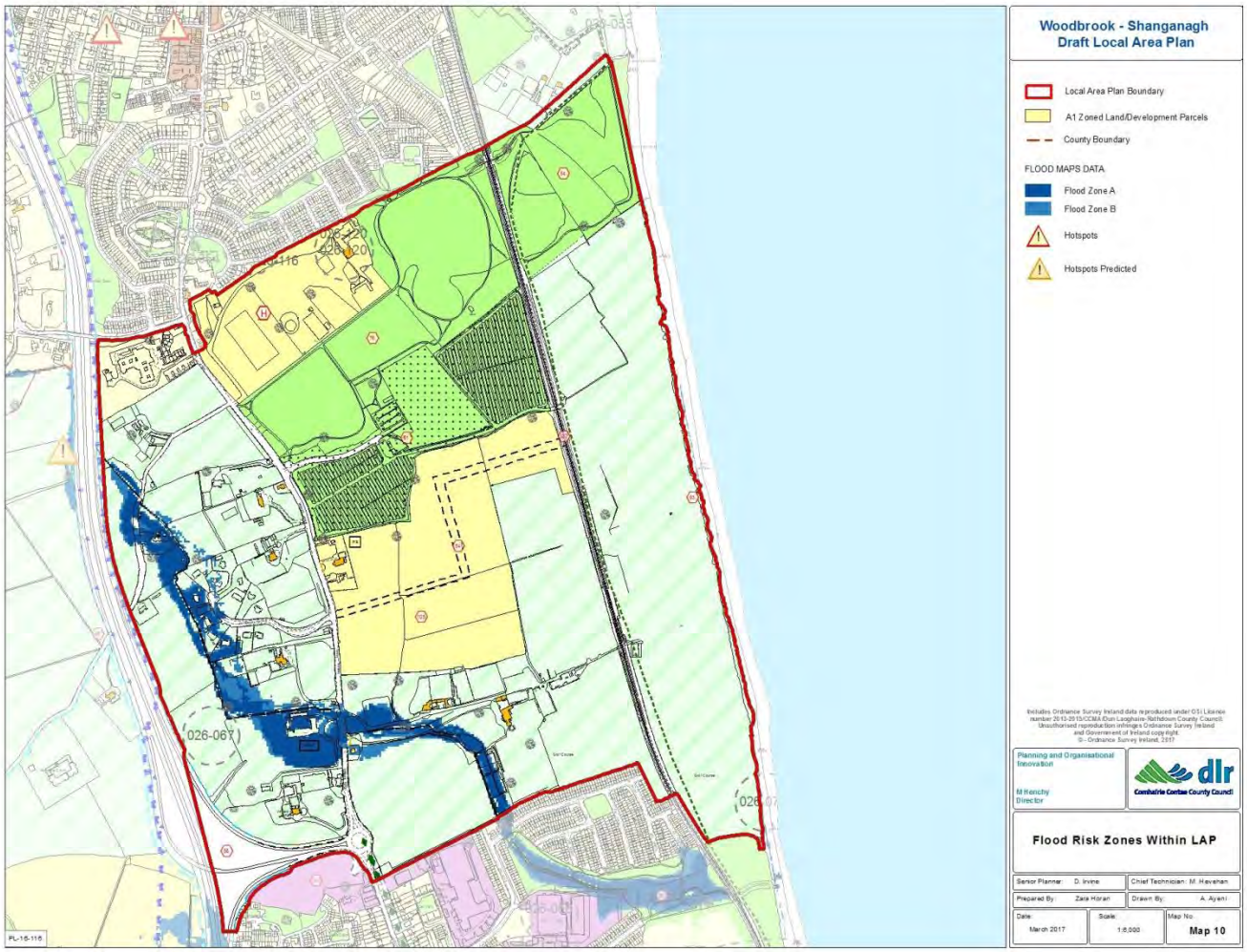
1.7 Woodbrook-Shanganagh LAP – Identification of Flood Risk

The Woodbrook-Shanganagh LAP lands are primarily located within Flood Zone C (Low Probability).

There are lands within the Plan Area located within Flood Zone A & B (High Probability & Moderate Probability), however, these lands relate to existing low-intensity development and are zoned as green belt or open space (Zoning Objectives GB & F) and as such will not be subject to major future development.

Importantly, the lands zoned for a new residential community are located entirely within Flood Zone C (Low Probability). These residential lands are identified as a major growth area or 'Future Development Area' within the Core Strategy of the Development Plan, which was subject to the Sequential and Justification Test as part of the SFRA informing the County Development Plan. (See Extract Below of Flood Risk Maps, Supplementary Mapping of CDP).

Fig 2: Flood Zones



Source: Extract from SFRA Dún Laoghaire Rathdown County Development Plan 2016-2022)

1.7.1 The Sequential Approach & Justification Test

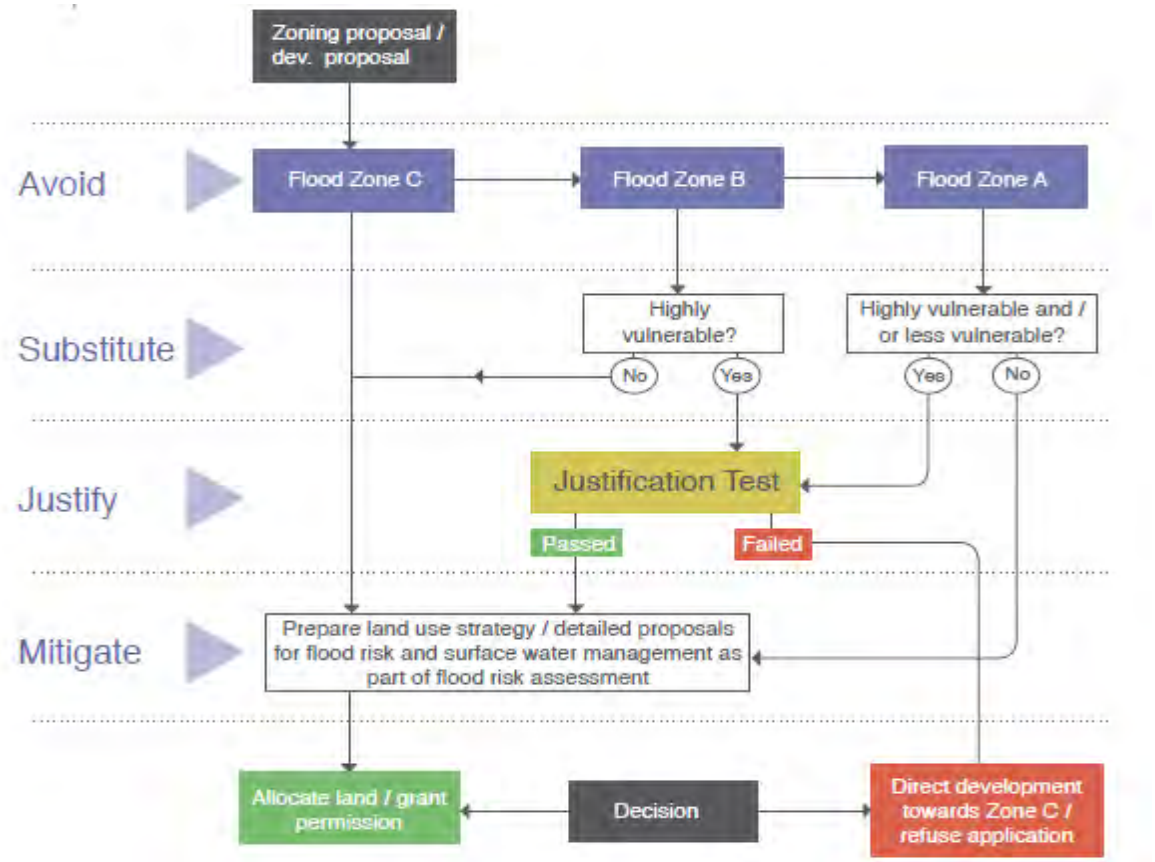
The key principles of the risk-based sequential approach is managing flood risk in the preparation of plans as set out the Chapter 3 of the DEHLG / OPW Guidelines and these principles will be adhered to in the Woodbrook-Shanganagh Area.

This is the key tool in the decision-making process of preparing plans to ensure that development is first and foremost directed towards land that is at low risk of flooding. This approach makes use of existing Flood Risk Assessments (FRAs) and other data identifying flood zones for rivers, coastal and fluvial flooding and the classification of the vulnerability of flooding of different types of development,

The sequential approach in terms of flooding is based on the following principles:

- The primary objective of the sequential approach is that development is primarily directed towards land that is at low risk of flooding (AVOID).
- The next stage is to ensure that the type of development proposed is not especially vulnerable to adverse impacts of flooding (SUBSTITUTION).
- The Justification Test is designed to rigorously asses the appropriateness, or otherwise, of particular developments that, for various reasons, are being considered in areas of moderate or high flood risk (JUSTIFICATION).
- The Justification Test comprises of two processes, namely, the Plan-Making Justification Test and the Development Management Justification Test.

Fig 3: The Sequential Approach Mechanism in the Planning Process



(Source: The Planning System and Flood Risk Management – Guidelines for Planning Authorities, 2009)

1.7.2 Justification Test for the Woodbrook-Shanganagh LAP Area

The SFRA undertaken for the County Development Plan, indicates that there are existing, developed and zoned areas at risk of flooding in the vicinity of the Plan area (Seafield, Bayview, Shankill) and that within the LAP, there are low-intensity and undeveloped lands in the vicinity of the Crinken Stream that have been identified as at risk of Flooding (Flood Zone A & Flood Zone B).

The application of the Justification Test to these lands as set out in the SFRA for the County Development Plan is as follows:

Crinken Stream
Flooding shown to the west of M50 south of Crinken Lane and east of M50 either side of Allies River Road, see Figure 5-1. Flood risk arising from Crinken Stream in this area primarily within land zoned as greenbelt (GB and F), which is water compatible and therefore appropriate within Flood Zone A and B and should be retained. Flooding is also shown at St. Brendan's School, Wilford and lands to north at Woodbrook Downs and Woodbrook Golf Course and open space associated with Woodbrook Glen residential development. This land is zoned as greenbelt.

There is also limited flood risk shown within existing development at the upstream end of the northern reach of the Stream (2). It is likely that opportunities for further development will be limited to small scale infill / extensions. At the upstream end of the Crinken Stream there is a plot which is currently undeveloped (3) and shown through the PFRA mapping to be at flood risk. Ground conditions also indicate high water table / poor infiltration of surface water at this site. Risks to these lands can be further defined through site specific risk assessment, following the guidance within this SFRA, with development in Flood Zone A & B to be avoided. (P.25-26, Section 5.3.1)

Note: Above Fig 5-1 of CDP SFRA shown as Fig 3 Above.

Woodbrook Shanganagh LAP – Core Strategy Key Growth Area – Flood Zone C
The lands zoned for new residential communities (Zoning Objective A1) have not been identified as being at flood risk and are shown on the flood zone maps as being within Flood Zone C (Low Probability).

The SFRA for the County Development Plan, states that with the exception of notable / limited areas (i.e. lands zoned Major Town Centre, District Centre and Sandyford Business District), that in respect of undeveloped land, new development which does not pass the Justification Test will not be permitted. It further states that applying the guidance, means that new development in undeveloped areas is restricted to Flood Zone C, with water compatible uses to be located in Flood Zones A & B.

Accordingly, the new residential development proposed under the forthcoming WS LAP accords with the Sequential Approach undertaken at the County Development Plan level as the higher tier Plan, with new development to occur on lands in Flood Zone C. It is relevant to note that under the SFRA for the County Development Plan, that there is no reference to any potential flood risk to the subject lands in the analysis of the Crinken Stream.

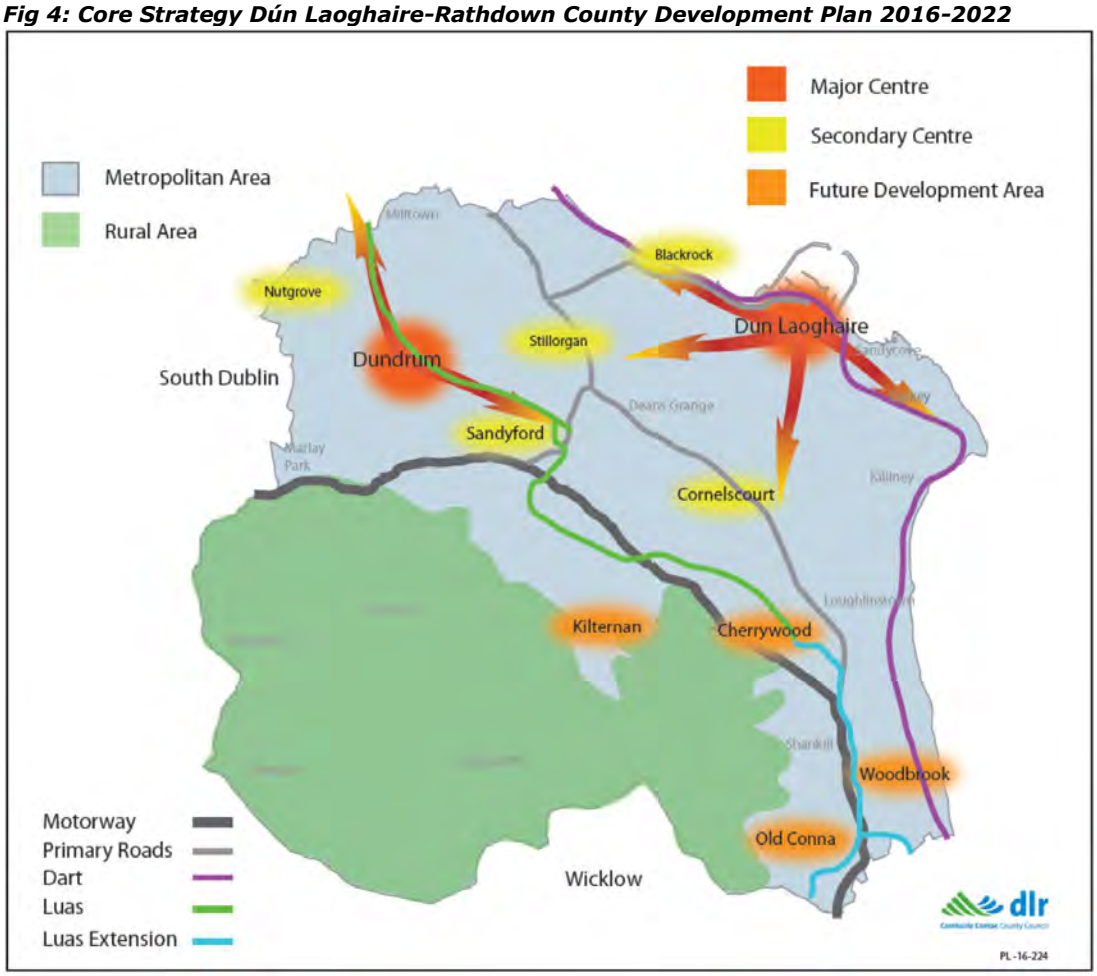
1.7.3 Settlement Strategy & Flood Risk

It is the strategy of Dún Laoghaire-Rathdown Council, in accordance with the DEHLG / OPW Guidelines to reduce the potential risk to people, property and the environment, caused by flooding, through a hierarchy of avoidance, followed by substitution of lower vulnerability uses and, only if avoidance and substitution are not possible, reduction and management of the risks through a variety of techniques.

Dún Laoghaire-Rathdown Council will continue its policy to steer new developments on greenfield sites to areas with the lowest probability of flooding. Areas with moderate or high risk will require Site Specific Flood Risk Assessments in any new planning applications and a subsequent Justification Test.

On examination of the flood risk in the WS LAP, it is evident that the area zoned for a new residential community and identified in the Core Strategy as a 'Future Development Area' is located in Flood Zone C, which is the flood zone with the lowest probability of flooding. Accordingly, a site Justification Test for these development lands at Local Plan level is not warranted.

Fig 4: Core Strategy Dún Laoghaire-Rathdown County Development Plan 2016-2022



1.7.4 Sources of Flooding – Neighbouring Greenbelt Lands

The SFRA for the County Development Plan 2016-2022 has identified the flood risk pertaining to the neighbouring greenbelt lands, which, although within the Plan area, are not proposed for new development (Zoned Objective GB & F)

The flood risk pertaining to these lands relates primarily to fluvial flooding associated with the Crinken Stream and ground conditions in the vicinity. The CFRAMS relate to both Flood Risk Assessment and Flood Management Studies.

Under the Eastern CFRAMS, it is envisaged that flood defence works will be proposed to alleviate the flooding arising from the Crinken Stream, which relates to an area of existing low-intensity development in Flood Zones A & B (High and Medium Probability).

1.7.5 Sources of Flooding – New Development Area

Surface Water Flooding
Surface water flooding occurs when the local drainage system cannot cope with the rainfall. The rainwater does not drain away through the normal drainage systems or soak into the ground but lies on, or flows over, the ground instead. Surface water flooding is unpredictable as it depends on a number of factors including ground levels, rainfall and the local drainage network. As part of the CFRAM Studies, it is anticipated that a number of flood management measures or defences for the flood zones on the greenbelt lands within the LAP, will be proposed by the OPW as the lead agency. Any such measures may include for example, hard defences (walls), bank raising or channel widening.

Groundwater Flooding
Groundwater flooding is usually as a result of water rising up from the underlying rocks or from water flowing from abnormal springs. These tend to occur after much longer periods of sustained rainfall. Higher rainfall means that water will infiltrate into the ground, causing the water table to rise. Ground water flooding tends to occur in low-lying areas, where, with additional groundwater flowing towards these areas, the water table can rise to the surface causing ground water flooding.

Pluvial Flood Risk
Pluvial Flooding results when heavy, often sudden rainfall causes flooding before it can infiltrate the ground, or enter a natural or man-made drainage system or watercourse or a conveyance system because the system is already full to capacity. Pluvial flooding is associated with Surface Water Flooding which is a combination of true pluvial flooding, sewer flooding (due to heavy rainfall), ground water flooding and flooding from urban watercourses.

1.7.6 Residual Risks (After Flood Defences are in Place)

Under the CFRAMS Project, it is anticipated that flood defence mechanisms will be proposed by the OPW to address the existing property flooding associated with the Crinken Stream. The flood defence mechanisms are likely to include hard defences and may provide additional protection to the lands zoned for new residential development in the LAP Area, which are located downstream and which in any case, in the absence of any flood management mechanism or construction of flood defences, are at a low-risk of flooding given the location of these lands in 'Flood Zone C' (Low Probability). Accordingly, it is considered that the lands proposed in the LAP for new development, will be at a negligible risk of flooding.

1.8 Conclusions and Recommendations

Having regard to the Strategic Flood Risk Assessment (SFRA) undertaken for the County Development Plan 2016-2022, the majority of lands within the WS LAP and all of the lands zoned for the creation of new residential communities (Zoning Objective A1) are located within Flood Zone C (Lowest Probability).

Accordingly, it is considered that development on these lands is in accordance with the sequential approach, which advocates that development is primarily directed towards land that is at low risk of flooding (AVOID) and as such complies with the guidance as set out in the Planning System & Flood Risk Management Guidelines for Planning Authorities, 2009.

All proposals for new development in the WS LAP Area shall have regard to the following:

- All planning applications for proposed development within the LAP Area should include a site-specific Flood Risk Assessment (FRA).

- Until the Eastern CFRAM Studies are completed and the flood protection and management options are finalised, the flood map should only be taken as indicative. All planning applications will be required to submit a site-specific flood risk assessment addressing risks from all sources of flooding, using the best available data. All new development will be required to comply with the Greater Dublin Strategic Drainage Study (GDSDS) for surface water management, with possible provision for the ECFRAMS High End Future Scenario. This will ensure that there is no increase in flood risk to properties downstream as a result of future development.

- Flood Risk Management Objectives, as incorporated into the Draft LAP will apply (See Appendix 1)

- Full SUDS measures will be incorporated into future development proposals (See Appendix 2)

1.9 Disclaimer

It is important to note that compliance with the requirements of '*The Planning System and Flood Risk Management - Guidelines for Planning Authorities, 2009,* and 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 awaits the publication / finalisation of Catchment Based Flood Risk Assessment and Management Plans (CFRAMP). As a result, this guide for Flood Risk Assessment is based on best available information and may require revision as new information becomes available.

Accordingly, all information in relation to flood risk is provided for general policy guidance only. It may be altered in light of future data and analysis. As a result, all landowners and developers are advised that Dún Laoghaire-Rathdown County Council accepts no responsibility for losses or damages arising due to the vulnerability to flooding of lands, uses and developments. It remains the principal responsibility of owners, users and developers to take all reasonable measures to assess the vulnerability to flooding of lands in which they have an interest prior to making planning or development decisions.

The indicative flood map does not show indicative flood hazard associated with any of the following:

- Extreme fluvial dominated combinations with the pluvial flows to Crinken Stream
- Extreme pluvial events
- Blocked drains
- High ground water level conditions
- Other unforeseen events, e.g. bridge /culvert collapse etc.

Dún Laoghaire-Rathdown County Council makes no representations, warranties or undertakings about any of the information provided in this Draft SFRA for the forthcoming WS LAP, including without limitation, on its accuracy, completeness, quality or fitness for any particular purpose. To the fullest extent permitted by applicable law, neither Dún Laoghaire-Rathdown County Council nor any of its members, officers, associates, consultants, employees, affiliates, servants, agents or other representatives shall be liable for loss or damage, arising out of or in connection with, the use of, or the inability to use, the information provided in this plan, including but not limited to, indirect or consequential loss or damages, loss of data, income, profit, or opportunity, loss or, or damage to, property and claims of third parties, even if Dún Laoghaire-Rathdown County Council has been advised of the possibility of such losses or damages, or such losses or damages were reasonably feasible. Dún Laoghaire-Rathdown County Council reserves the right to change the content and / or presentation of any of the information provided in this report at its sole discretion, including these notes and disclaimer. This disclaimer shall be governed by, and construed in accordance with, the laws of the Republic of Ireland. If any provision of this disclaimer shall be unlawful, void or for any reasons unenforceable, that provision shall be deemed severable and shall not affect the validity and enforceability of the remaining provisions.

APPENDICES TO SFRA

APPENDIX 1: Flood Risk Management Strategy Objectives

(*See Section 3.3 Sustainable Infrastructure of Draft LAP*)

SI3:	To require all proposed developments to carry out a Site-Specific Flood Risk Assessment (SSFRA) that shall demonstrate compliance with: • The Planning System and Flood Risk Management, Guidelines for Planning Authorities (DEHLG / OPW, 2009), as may be revised and/or updated • The prevailing Dún Laoghaire-Rathdown County Development Plan. • Any SSFRA shall not be required to carry out a Justification Test, given that this exercise was already carried out at County Development Plan-level. A review of this process was also undertaken as part of the preparation of this Local Area Plan (LAP). • The SSFRA shall pay particular emphasis to site-specific mitigation measures and any necessary management measures, as per Appendix B4 of the above 2009 National Guidelines. • Attention shall be given in the SSFRA to the incorporation of SuDS design measures into the public realm and open space provision.
SI4:	To achieve best-practice and innovations in SuDS design as part of the Local Area Plan, including the successful co-ordination of surface water management with ecology and the amenity functions of open space and landscaped areas. All planning applications shall be accompanied by a surface water drainage plan which will include proposals for the management of surface water within sites and the protection of the water quality of existing water bodies and groundwater sources.
SI5:	To pilot and test new green infrastructure installations in the public realm to boost biodiversity and improve surface water management, including the use of permeable materials for surfaces, green roofs and the provision of storm water tree trenches / pits.
SI6:	To support the development of soft landscaping in public open spaces, where feasible in accordance with the principles of Sustainable Drainage Systems (SuDS).
SI7:	That green roofs shall be provided in accordance with the County Development Plan Green Roofs Guidance Document.

APPENDIX 2: SuDS Measures for New Development

It is an objective to promote Sustainable Drainage Systems (SuDS) to manage surface and ground water regimes sustainably. The following measures are key elements of the SUDS solution proposed for the LAP Area in the public realm areas, i.e. those areas not within private developments.

SuDS in the Public Realm: Options for Consideration Include:

Ponds: These will provide storage to meet attenuation requirements for the 1 in 100 year criterion. Ponds provide the final stage of treatment for water runoff prior to discharge to the watercourses. Ponds also provide amenity and biodiversity benefits in accordance with best design practice.

Detention Basins: These are vegetated surface storage basins that provide flow control through attenuation of stormwater runoff. They also facilitate some settling of particulate pollutants. They are normally dry and in most cases can accommodate soft landscaping and contribute to local amenity.

Infiltration Basins: Located at carefully selected locations in the detention basins. These are vegetated depressions designed to store run off and infiltrate it gradually into the ground. These are very effective at pollutant removal and contribute to groundwater recharge.

Infiltration Trenches & Engineered Swales: These can be **l**ocated throughout public realm spaces and along selected routes including green routes and cycle routes. These are narrow excavations (1 to 2 m depth) filled with selected stone that create temporary subsurface storage for infiltration of stormwater runoff.

Underground Modular Systems: These have a high void ratio (e.g. Stormtech system or similar) and can be used subject to agreement with the Local Authority in any suitable locations of open spaces and parks subject to level and ready access to provide below ground storage and infiltration.

Tree Root Structural Cell Systems: (e.g. Silva Cell) are subsurface tree and stormwater systems that hold large soil volumes while supporting traffic loads beneath paving and hardscapes. It is proposed that these will be used throughout the LAP area to assist with attenuation and groundwater recharge.

SuDS in Development Sites

Run-off from all sites must pass through at least one level of treatment using a SuDS component prior to the final level of treatment in the public realm areas. The various SuDS measures that are required for different development types include:

Green Roofs: As well as providing environmental benefits, the installation of green roofs allows for more efficient use of space. Properly placed roof terraces and gardens visible from residential units or within a building enhance the aesthetic experience of the building and open up additional space for amenity, recreational and commercial use. Internal courtyards, terraces and roof tops can serve as multi-functional spaces.

Pervious Paving / Permeable Surfacing: Where courtyards and walkways in landscaped areas are proposed, it is suggested that permeable surfacing is considered. A variety of new durable permeable surfacing solutions are now available on the market

(proposals where surface water accesses the underground storage via gaps in interlocking paving will not be permitted – grilles, gullies, or similar, that are easily maintained are only permitted).

Infiltration Trenches: See Above

Detention Basins: See Above

Swales: Swales are shallow, flat bottomed vegetated open channels designed to convey, treat and attenuate surface water runoff. For design guidance refer to Chapter 17 of the CIRA SuDS Manual 2015.

Water Butts: Large containers used for collecting and storing rainwater for use on the property. Generally plastic and located to the rear of a property and connected to the downpipe.

Tree Root Structural Cell Systems: See Above

Rain Water Harvesting: Rainwater is collected from a roof or paved surface in an underground or over ground tank for use on the site. Depending on its intended usage the system may include treated elements, for design guidance refer to Chapter 11 of the CIRIA SuDS Manual 2015.

APPENDIX 3: Glossary of Terms

Annual Exceedance Probability (AEP) - Likelihood or probability of flooding or a particular flood event is classified by its annual exceedance probability (AEP) or return period (in years). A 1% AEP flood indicates the flood event that will occur or be exceeded on average once every 100 years and has a 1 in 100 chance of occurring in any given year.

Catchment - The area that is drained by a river or artificial drainage system.

Catchment Flood Risk Assessment and Management Studies (CFRAMS) - A catchment-based study involving an assessment of the risk of flooding in a catchment and the development of a strategy for managing that risk in order to reduce adverse effects on people, property and the environment. CFRAMS precede the preparation of Flood Risk Management Plans.

Flood Risk - An expression of the combination of the flood probability or likelihood and the magnitude of the potential consequences of the flood event. Flood Risk Assessment (FRA) can be undertaken at any scale from the National down to the individual site and comprises three stages: flood risk identification, initial flood risk assessment and detailed flood risk assessment.

Flooding (or inundation) – Flooding is the overflowing of water onto land that is normally dry. It may be caused by overtopping or breach of banks or defences, inadequate or slow drainage of rainfall, underlying groundwater levels or blocked drains and sewers. It presents a risk only when people, human assets and ecosystems are present in the areas that flood.

Flood Defence – A man-made structure (e.g. embankment, bund, sluice gate, reservoir or barrier) designed to prevent flooding of areas adjacent to the defence.

Flood Risk Assessment (FRA) - An examination of the risks from all sources of flooding of the risks to and potentially arising from development on a specific site, including an examination of the effectiveness and impacts of any control or mitigation measures to be incorporated in that development.

Flood Zones - A geographic area for which the probability of flooding from rivers, estuaries or the sea is within a particular range as defined within these Guidelines.

Fluvial Flooding - Flooding from a river or other watercourse.

Groundwater Flooding – Flooding caused by groundwater escaping from the ground when the water table rises to or above ground level.

Initial Flood Risk Assessment - A qualitative or semi-quantitative study to confirm sources of flooding that may affect a Plan area or proposed development site, to appraise the adequacy of existing information, to provide a qualitative appraisal of the risk of flooding to development, including the scope of possible mitigation measures, and the potential impact of development on flooding elsewhere, and to determine the need for further detailed assessment.

'Justification Test' - An assessment of whether a development proposal within an area at risk of flooding meets specific criteria for proper planning and sustainable development and demonstrates that it will not be subject to unacceptable risk nor increase flood risk elsewhere. The 'Justification Test' should be applied only where

development is within flood risk areas that would be defined as inappropriate under the screening test of the sequential risk based approach adopted by this guidance.

Likelihood (probability of flooding) – A general concept relating to the chance of an event occurring. Likelihood is generally expressed as a probability or frequency of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is based on the average frequency estimated, measured or extrapolated from records over a large number of years and is usually expressed as the chance of a particular flood level.

Mitigation Measures - Elements of a development design which may be used to manage flood risk to a development, either by reducing the incidence of flooding both to the development and as a result of it and/or by making the development more resistant and/or resilient to the effects of flooding.

Precautionary Approach - The approach to be used in the assessment of flood risk which requires that lack of full scientific certainty, shall not be used to assume flood hazard or risk does not exist, or as a reason for postponing cost-effective measures to avoid or manage flood risk. River Basin Management Plan (RBMP) is required by the EU Water Framework Directive (2000/60/EC). These plans will establish a strategic plan for the long-term management of the River Basin District, set out objectives for water bodies and in broad terms, identify what measures are planned to meet these objectives, and act as the main reporting mechanism to the European Commission.

Pluvial Flooding - Usually associated with convective summer thunderstorms or high intensity rainfall cells within longer duration events, pluvial flooding is a result of rainfall-generated overland flows which arise before run-off enters any watercourse or sewer. The intensity of rainfall can be such that the run-off totally overwhelms surface water and underground drainage systems.

Return Period - The return period is means of expressing the likelihood or probability of flooding or a particular flood event occurring and is comparable to the AEP of the event. A 1% AEP flood indicates the flood event that will occur or be exceeded on average once every 100 years and has a 1 in 100 chance of occurring in any given year.

'Sequential Approach' - The 'Sequential Approach' is a risk-based method to guide development away from areas that have been identified through a flood risk assessment as being at risk from flooding.

Site Specific Flood Risk Assessment – An examination of the risks from all sources of flooding of the risks to and potentially arising from development on a specific site, including an examination of the effectiveness and impacts of any control or mitigation measures to be incorporated in that development.

Strategic Flood Risk Assessment (SFRA) - The assessment of flood risk on a wide geographical area against which to assess development proposed in an area (Region, County, Town).

Surface Water Management – This activity focuses on the assessment and management of flood risk within the urban environment from sources primarily resulting from intense rainfall. Surface water management should understand the performance of the urban drainage network, where exceedance flow routes would form and what impact this would have. Solutions to surface water flood risk can involve green infrastructure provision to capture and direct these excessive flows to lower vulnerable areas or open space. New development can provide solutions to reducing run-off not only from the proposed development also from existing areas. This should be considered in the SFRA in critical areas where development is planned upstream of flooding hotspots**.**

Sustainable Drainage Systems (SuDS) - A form of drainage that aims to control run-off as close to its source as possible using a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques.

Source: Definitions are for the most part sourced from the DEHLG / OPW Guidelines for Planning Authorities on 'The Planning System and Flood Risk Management, 2009'.

dlr
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